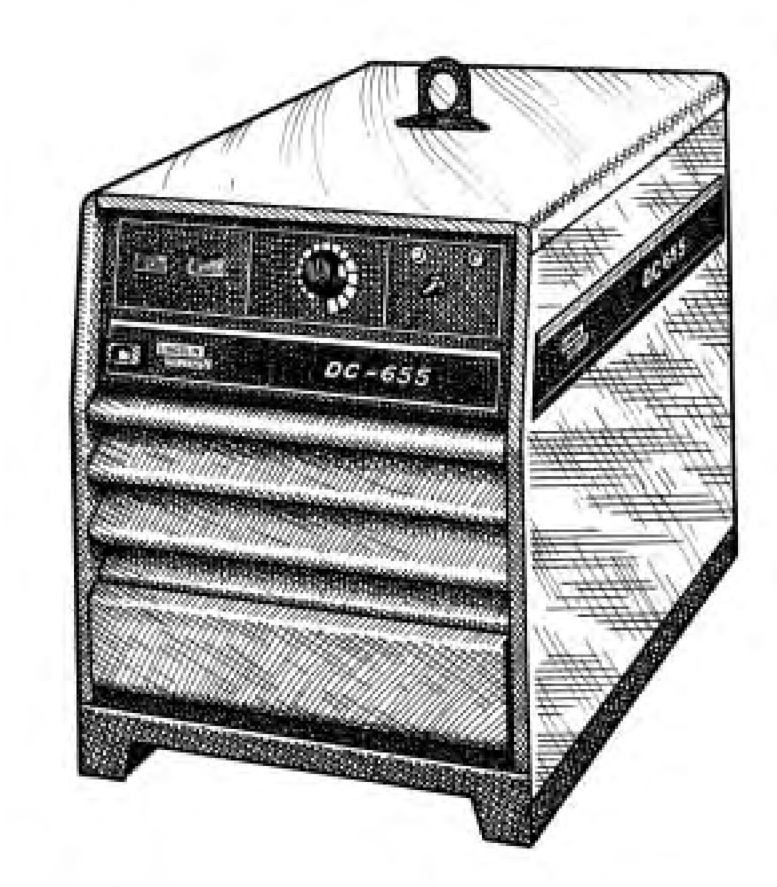
SVM142-A
September, 2002

IDEALARC ™ DC-655

For use with machine code number **10501 thru 10510**



Safety Depends on You

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation . . . and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

SERVICE MANUAL

LINCOLN ® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

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WARNING

CALIFORNIA PROPOSITION 65 WARNINGS

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Above For Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The Above For Gasoline Engines

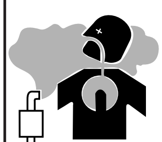
ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE powered equipment.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.



1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.



1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.



1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

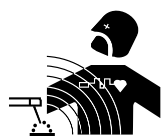
1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.



1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC



ELECTRIC SHOCK can kill.

3.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- **Semiautomatic DC Constant Voltage (Wire) Welder.**
- **DC Manual (Stick) Welder.**
- **AC Welder with Reduced Voltage Control.**

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

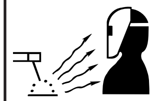
3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

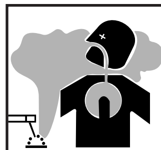


ARC RAYS can burn.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



FUMES AND GASES can be dangerous.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

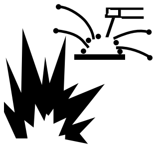
5.b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.d. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.e. Also see item 1.b.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC



WELDING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to “Safety in Welding and Cutting” (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

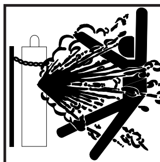
6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances”, AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.



CYLINDER may explode if damaged.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:
- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



FOR ELECTRICALLY powered equipment.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer’s recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer’s recommendations.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:
   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enroule le câble-électrode autour de n'importe quelle partie du corps.
3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:
   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnementde l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.
4. Des gouttes de laiter en fusion sont émises de l'arc de soudage. Se protéger avec es vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.
5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.
6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir ttout risque d'incendie dû étincelles.
7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.
8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de la faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou atres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.
9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumées toxiques.
10. Ne pas souder en présence de vapeurs de chlore provenant d'opéerations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement roxique) ou autres produits irritants.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.
2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.
3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.
4. Garder tous les couvercles et dispostifis de sûreté à leur place.

MASTER TABLE OF CONTENTS FOR ALL SECTIONS

RETURN TO MAIN INDEX

TABLE OF CONTENTS
- INSTALLATION SECTION -

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC

TECHNICAL SPECIFICATIONS – DC-655

INPUT - THREE PHASE ONLY

Standard Voltage	Input Current at Rated Output 100% Duty Cycle	Input Current at Rated Output 60% Duty Cycle	Code Number
230/460/60	122/61	150/75	10501
230/460/575/60	122/61/49	150/75/60	10502
208/416/60	135/67.5	166/83	10503
460/60	61	75	10504
575/60	49	60	10505
230/400/50/60*	122/70	150/86	10506
380/500/50/60*	74/56	90/69	10507
440/50/60	64	78	10508
200/400/50/60	140/70	172/86	10509
415/50/60	68	83	10510

RATED OUTPUT

Duty Cycle	Amps	Volts at Rated Amperes
100% Duty Cycle NEMA Class I (100)*	650	44
60% Duty Cycle	815	44

OUTPUT

Voltage Range	Current Range	Maximum Open Circuit Voltage	Auxiliary Power
13-44 DC	50-815	46 CV Mode 68 CC Mode	See the OPERATION section for Auxiliary Power information by model

RECOMMENDED INPUT WIRE AND FUSE SIZES

INPUT VOLTAGE / FREQUENCY	HERTZ	INPUT AMPERE RATING ON NAMEPLATE	TYPE 80°C COPPER WIRE IN CONDUIT AWG(IEC-MM²) SIZES 40°C (104°F) Ambient	Copper GROUND WIRE IN CONDUIT AWG(IEC-MM²) SIZES	(SUPER LAG) OR BREAKER SIZE (AMPS)[1]
208	60	135	1 (43)	4 (21)	250 Amp
230	60	122	1 (43)	4 (21)	225 Amp
416	60	67.5	6 (14)	6 (14)	125 Amp
460	60	61	6 (14)	6 (14)	110 Amp
575	60	49	8 (8.4)	8 (8.4)	90 Amp
200	50/60	140	1/0 (54)	4 (21)	250 Amp
230	50/60	122	1 (43)	4 (21)	225 Amp
380	50/60	74	4 (21)	6 (14)	125 Amp
400	50/60	70	4 (21)	6 (14)	125 Amp
415	50/60	68	6 (14)	6 (14)	110 Amp
440	50/60	64	6 (14)	6 (14)	110 Amp
500	50/60	56	6 (14)	6 (14)	110 Amp

PHYSICAL DIMENSIONS

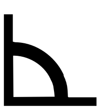
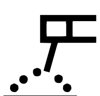
HEIGHT	WIDTH	DEPTH	WEIGHT
27.5 in 699 mm	22.2 in 564 mm	38.0 in 965 mm	720 lbs. 326 kg.

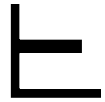
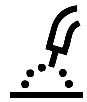
* European models meet IEC974-1 standards.

[1] Also called “inverse time” or “thermal/magnetic” circuit breakers; circuit breakers which have a delay in tripping action that decreases as the magnitude of the current increases.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

GRAPHIC SYMBOLS THAT APPEAR ON RATING PLATE (LOCATED ON CASE BACK)

Symbol	Description
	3 Phase transformer with rectified DC output
	**INPUT POWER**
3 ∿	**THREE PHASE**
NEMA EW 1 (100%)	Designates welder complies with National Electrical Manufacturers Association requirements EW 1 Class I with 100% duty cycle at 650Amps output. (Domestic, Canadian, and Export models)
IEC 974-1	Designates welder complies with International Electrotechnical Commission requirements 974-1. (European Models)
IP-23	Designates the degree of environmental protection provided by the power sources enclosure.
	Constant Current Output Characteristics
	**SMAW**
	**SAW**

Symbol	Description
	Constant Voltage Output Characteristics
	**GMAW**
	**FCAW**
	Designates welder can be used in environments with increased hazard of electric shock. (European models)
CE	Designates welder complies with low voltage directive and with EMC directive. (European models)
NRTL/C	Designates welder complies with both Underwriters Laboratories (UL) standards and Canadian Standards Association (CSA) standards. (Canadian Model)
NRTL	Designates welder complies with Underwriters Laboratories (UL) standards. (Domestic Models)
U_o	Open Circuit Output Voltage
U_1	Input Voltage Rating(s)
I_1	Input Current Rating(s)
X	Output Duty Cycle Rating(s)
U_2	Output Voltage Rating(s)
I_2	Output Current Rating(s)

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Read this entire installation section before you start installation.

SAFETY PRECAUTIONS

⚠ WARNING



ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.
- Turn the Power Switch on the DC-655 "OFF" before connecting or disconnecting output cables, wire feeder or remote connections, or other equipment.
- Do not touch electrically hot parts.
- Always connect the Idealarc DC-655 grounding terminal (located on the welder near the reconnect panel) to a good electrical earth ground.

SELECT SUITABLE LOCATION

Place the welder where clean cooling air can freely circulate in through the front louvers and out through the rear louvers. Dirt, dust or any foreign material that can be drawn into the welder should be kept at a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shut-downs.

STACKING

The DC-655 may be stacked three-high provided the bottom machine is on a stable, hard, level surface. Be sure that the two pins in the roof fit into the slots in the base of the DC-655 above it.

TILTING

Do not place the machine on a surface that is inclined enough to create a risk of the machine falling over.

ELECTRICAL INPUT CONNECTIONS

Before installing the machine check that the input supply voltage, phase, and frequency are the same as the voltage, phase, and frequency as specified on the welder nameplate.

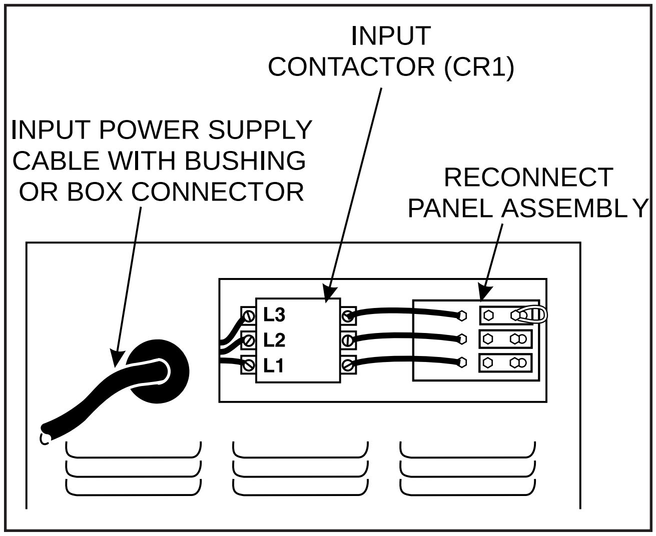


FIGURE A.1 - ELECTRICAL INPUT CONNECTIONS

Use input wire sizes that meet local electrical codes or see the ***Technical Specifications*** page in this manual.

Input power supply entry is through the hole in the Case Back Assembly. See Figure A.1 for the location of the machine's input cable entry opening, Input Contactor (CR1), and reconnect panel.

FUSE AND WIRE SIZES

Protect the input circuit with the super lag fuses or delay type circuit breakers listed on the ***Technical Specifications*** page of this manual for the machine being used. They are also called inverse time or thermal/magnetic circuit breakers.

DO NOT use fuses or circuit breakers with a lower amp rating than recommended. This can result in "nuisance" tripping caused by inrush current even when machine is not being used for welding at high output currents.

GROUND CONNECTION

Ground the frame of the machine. A ground terminal marked with the symbol ⏚ is located inside the case back of the machine near the input contactor. Access to the input box assembly is at the upper rear of the machine. See your local and national electrical codes for proper grounding methods. Use grounding wire sizes that meet local electrical codes or see the Technical Specifications page in this manual.

Return to Section TOC
Return to Master TOC

INPUT POWER SUPPLY CONNECTIONS

A qualified electrician should connect the input power supply leads.

1. Follow all national and local electrical codes.
2. Use a three-phase line.
3. Remove the input access door at upper rear of the machine.
4. Follow input supply connection diagram located on the inside of the door.
5. Connect the three-phase AC power supply leads L1, L2, and L3 to the input contactor terminals in the input box assembly. See ***Figure A.1.***

RECONNECT PROCEDURE

⚠ WARNING



Electric Shock Can Kill

- Disconnect input power before performing this procedure.

Multiple voltage machines are shipped connected to the highest input voltage listed on the machine's rating plate. Before installing the machine, check that the reconnect panel in the input box assembly is connected for the proper voltage.

⚠ CAUTION

Failure to follow these instructions can cause immediate failure of components within the machine.

To reconnect a multiple voltage machine to a different voltage, remove input power and follow the input connection diagram located on the inside of case back input access door.

1. For dual voltage sample machine reconnect instructions, see Figure A.2.

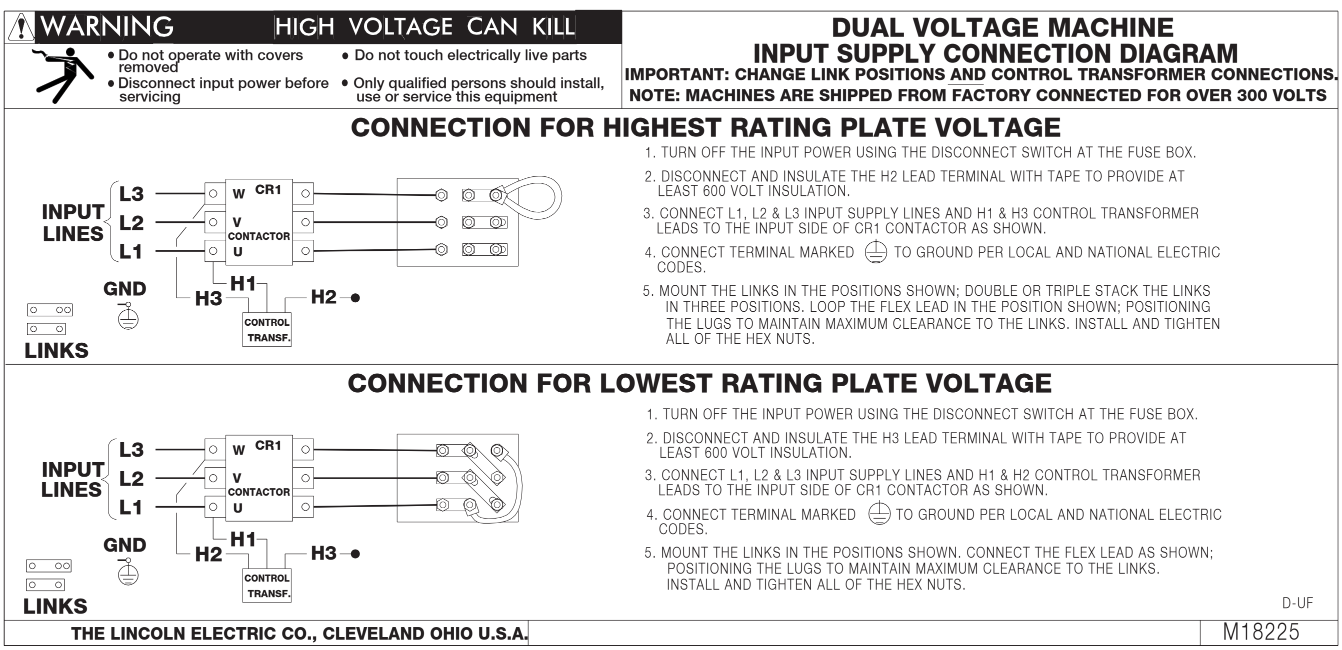


FIGURE A.2 - DUAL VOLTAGE MACHINE RECONNECTION PROCEDURE

Return to Section TOC
Return to Master TOC

OUTPUT CONNECTIONS

ELECTRODE AND WORK CABLES

Use the shortest possible cable lengths. See Table A.1 for recommended cable sizes based on length.

TABLE A.1
Cable Sizes for Combined Lengths of Copper Electrode and Work Cable

Cable Length ft. (m)	Parallel Cables	Cable Size
0 (0) to 100 (30.4)	2	2/0 (70mm^2)
100 (30.4) to 200 (60.8)	2	3/0 (95mm^2)
200 (60.8) to 250 (76.2)	2	4/0 (120mm^2)

The output terminals are located at the lower front of the welder behind a hinged door. Refer to Figure A.3. Route the welding cables through the slotted strain reliefs of the base to the welding terminals.

LOW INDUCTANCE TERMINAL

On the DC-655, the inside right Negative (-) output terminal is lower choke inductance. This terminal is presently only recommended for CV mode welding with NR203Ni 1% negative polarity procedures.. All other processes are to be welded using the outside right Negative (-) output terminal with higher choke inductance. CC mode processes must use high inductance.

For Positive Polarity:

1. Connect the work cable to the high inductance (-) terminal (marked " ").
2. Connect the electrode cable to the positive terminal marked "+".
3. Remove the terminal strip access cover panel on the lower case front. Refer to Figure A.3 for the location.
4. Work Sense lead #21 from the 14 Pin MS-receptacle must be connected to "-21"on the terminal strip. **Note: This is how the DC-655 is shipped from the factory.**
5. Replace the terminal strip access cover panel.

For Negative Polarity:

1. Connect the electrode cable to the appropriate high inductance (-) terminal (marked " ") or to the low inductance (-) terminal (marked " ") if using NR203Ni 1% electrode.
2. Connect the work cable to the positive terminal marked "+".
3. Remove the terminal strip access cover panel on the lower case front. Refer to Figure A.3 for the location.
4. Work Sense lead #21 from the 14 Pin MS-receptacle must be connected to "+21"on the terminal strip.
5. Replace the terminal strip access cover panel.

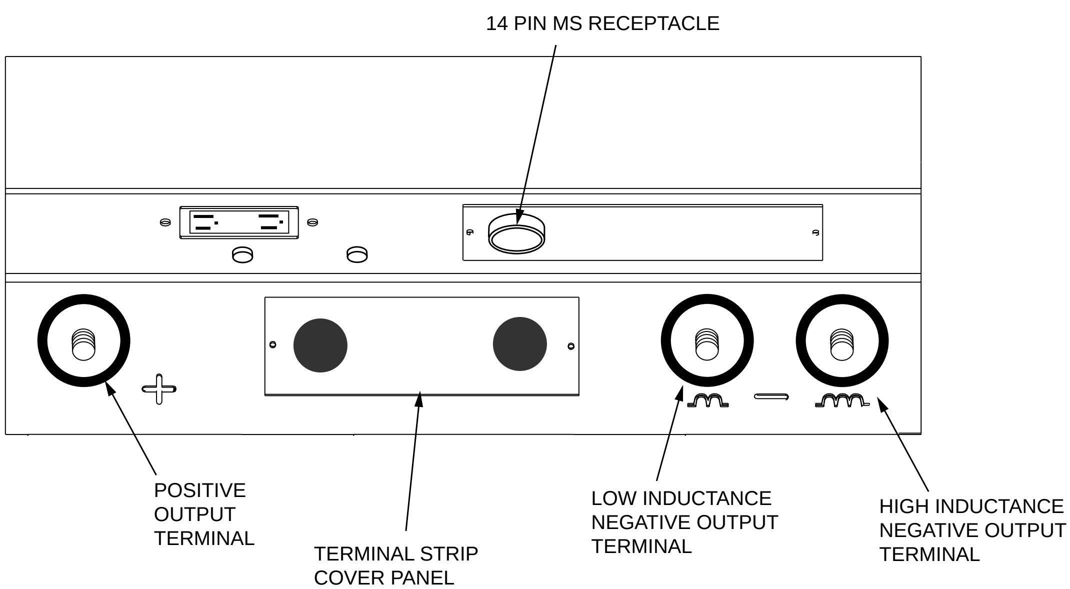


FIGURE A.3 - OUTPUT CONNECTIONS

Return to Section TOC
Return to Master TOC

AUXILIARY POWER AND CONTROL CONNECTIONS

Located at the lower front of the welder behind a hinged door is a 115 VAC duplex receptacle for auxiliary power (Domestic and Canadian Models only) and a 14-pin MS type receptacle for connection of auxiliary equipment such as wire feeders. Also, terminal strips with 115 VAC and connections for auxiliary equipment are located behind the access panel on the lower case of the welder. A 220 VAC receptacle for a water cooler (European and Export Models only) is located on the case back.

AUXILIARY POWER TABLE

Voltage and Circuit Breaker Ratings at Auxiliary Power Connections for Various Models

Auxiliary Power Connections	Domestic Models (60Hz)	Canadian Model (230/460/575V/60 Hz)	European Models (50/60 Hz)	Export Models (50/60 Hz)
At Duplex Receptacle	115V 20A	115V 15A	No Duplex	No Duplex
Terminal strip terminals 31 & 32	115V 20A	115V 15A	115V 15A	115V 15A
MS-Receptacle pins A & J	115V 20A	115V 15A	Open Circuit	115V 15A
MS-Receptacle pins I & K	42V 10A	42V 10A	42V 10A	42V 10A
At 220V Receptacle	No Receptacle	No Receptacle	220V 2A	220V 2A

115 VAC DUPLEX RECEPTACLE (DOMESTIC AND CANADIAN MODELS ONLY)

The 115 VAC duplex receptacle is protected by a circuit breaker located below the receptacle (see Auxiliary Power Table). Receptacle is a NEMA 5-20R (protected by a 20 amp breaker) on Domestic Models and a NEMA 5-15R (protected by a 15 amp breaker) on Canadian Models.

230 VAC RECEPTACLE (EUROPEAN AND EXPORT MODELS ONLY)

A Continental European receptacle is located on the rear panel for supplying 220 VAC to a water cooler. The receptacle has a protective cover to prevent accidental contact and is a Schuko type. The circuit is protected by a 2 amp circuit breaker also located on the rear panel. This circuit is electrically isolated from all other circuits, but on the European Models one line is connected to chassis ground.

14-PIN MS TYPE RECEPTACLE

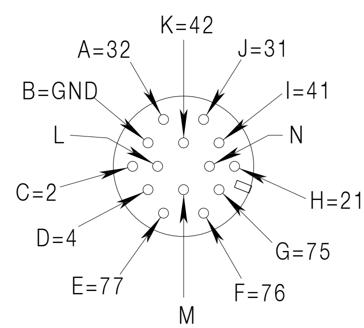
(For MS3106A-20-27PX Plug. L.E.C. Part #S12020-32)

Refer to the Figure A.4 for the available circuits in the 14-pin receptacle.

42 VAC is available at receptacle pins I and K. A 10 amp circuit breaker protects this circuit.

115 VAC is available at receptacle pins A and J (Domestic, Canadian and Export Models). This circuit is protected by a circuit breaker (see Auxiliary Power Table). Note that the 42 VAC and 115 VAC circuits are electrically isolated from each other. However, on the European model one line of the 115 VAC is connected to chassis ground.

FIGURE A.4 - FRONT VIEW OF 14-PIN CONNECTOR RECEPTACLE



PIN	LEAD NO.	FUNCTION
A	32	115 VAC
B	GND	Chassis Connection
C	2	Trigger Circuit
D	4	Trigger Circuit
E	77	Output Control
F	76	Output Control
G	75	Output Control
H	21	Work Sense Connection[2]
I	41	42 VAC
J	31	115 VAC[1.]
K	42	42 VAC
L	---	---
M	---	---
N	---	---

1. 115VAC circuit is not present in the 14-pin connector on IEC 974-1 European models.

2. As shipped from the factory Lead #21 from the 14-pin connector is connected to "-21" on the terminal strip. This is the configuration for positive welding. If welding negative polarity, connect lead #21 to the "+21" connection point on the terminal strip.

TERMINAL STRIPS

Terminal strips are available behind the cover panel on the lower case front to connect wire feeder control cables that do not have a 14-Pin MS-type connector. Refer to Figure A.3 for the location of this cover panel. These terminals supply the connections as shown in the following Terminal Strip charts. See Auxiliary Power Table for rating of circuit breaker in 115 VAC circuit. Remove a plug button from the terminal strip cover and install an appropriate strain relief clamp for the cable being used. NOTE: There are two work sense lead connection points on the terminal strip. Connect both the work sense lead #21 from the 14-pin connector and #21 lead of the control cable to “-21” when welding positive polarity or to “+21” when welding negative polarity.

TERMINAL STRIP 1 (T.S.1)

Lead No.	Function
75	Output Control
76	Output Control
77	Output Control

TERMINAL STRIP 2 (T.S.2)

Lead No.	Function
+21	Work Connection
-21	Work Connection[2]
41	42 VAC
4	Trigger Circuit
2 (42 VAC)	Trigger Circuit (42 VAC)
31	115 VAC[1]
32	115 VAC[1]

[1] 115 VAC circuit is also present on IEC 974-1 European models.

[2] If connecting a feeder cable directly to the terminal strip, Lead #21 from the cable is connected to “-21” on the terminal strip for positive welding. If welding negative polarity, connect lead #21 to the “+21” connection point on the terminal strip.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

TABLE OF CONTENTS
- OPERATION SECTION -

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

OPERATING INSTRUCTIONS

Read and understand this entire section of operating instructions before operating the machine.

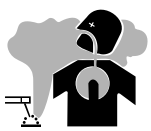
SAFETY PRECAUTIONS

⚠ WARNING



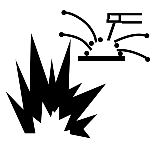
ELECTRIC SHOCK can kill.

- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry, insulating gloves.



FUMES AND GASES can be dangerous.

- Keep your head out of fumes.
- Use ventilation or exhaust to remove fumes from breathing zone.



CUTTING SPARKS can cause fire or explosion.

- Keep flammable material away.
- Do not cut containers that have held combustibles.



ARC RAYS can burn.

- Wear eye, ear, and body protection.

Observe additional Safety Guidelines detailed in the beginning of this manual.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

GENERAL DESCRIPTION

The DC-655 is an energy efficient constant voltage DC power source that produces outstanding arc characteristics for multiple CV or CC welding processes.

Four models are available:

Domestic - all 60 Hertz models except 230/460/575v. NEMA Class 1 rated

Canadian - 230/460/575v 60 Hertz NEMA Class 1 rated

European - 50/60 Hertz models "CE" qualified and rated for IEC 974-1

Export - 50/60 Hertz models NEMA Class 1 rated

RECOMMENDED PROCESSES AND EQUIPMENT

The DC-655 is designed for CV or CC processes.

CV processes include: GMAW (MIG) and FCAW (flux-cored) welding, plus the capability of CV submerged arc welding and air carbon arc gouging. It produces outstanding welding performance with a single range full output control knob.

CC processes include stick welding, CC submerged arc and superior air carbon arc gouging with up to 3/8" (10 mm) diameter carbons. The same single range full output control knob is used and paralleling capability is provided.

The DC-655 is recommended for use with Lincoln's DH-10 or LN-10 as well as the LN-7*, LN-7 GMA*, LN-742, LN-8*, LN-9*, LN-9 GMA*, LN-23P and LN-25 semiautomatic wire feeders. It is also recommended for use with the NA-3, NA-5 and NA-5R automatic feeders. "Cold starting" for sub-arc or across arc "touch-sensing" can be used.

* The 14-pin MS receptacle on the European models does not provide 115 VAC for these feeders; 115 VAC must be obtained from terminal strip.

Two DC-655's may be paralleled in a "master" and "slave" interconnection using the K1611-1 Paralleling kit.

DESIGN FEATURES AND ADVANTAGES

- Separate output terminals for selecting high or low inductance as recommended for the welding process.
- Power on/off switch with pilot light and thermostat tripped indicator light.
- Full range output voltage (CV mode) and current (CC mode) control for easy operation.
- Panel switches behind a latched front panel for remote or local output control, output on or remote selection, and CC, CV Sub-arc or CV MIG mode selection.
- Panel knob settable CC arc force control with built-in adjustable "Hot Start".
- High efficiency output, and selectable "sleep mode" idle mode timer which shuts down input power if not used for extra energy conservation.
- Fan as needed (F.A.N.). Solid state thermally controlled fan operates cooling fan only when required. Minimizes power consumption, operating noise and dust intake.
- Hinged cover to protect output terminals and auxiliary connections.
- Electronic and thermostatic protection for current overload and excessive temperatures.
- 42 VAC, 10 amp auxiliary power available for the wire feeder; circuit breaker protected.
- 115 VAC, auxiliary power available for the wire feeder; circuit breaker protected. 20 amp breaker on Domestic model and 15 amp breaker on Canadian, European, and Export Models.
- 115 VAC duplex plug receptacle available on Domestic and Canadian Models. 20 amp breaker on Domestic Models and 15 amp breaker on Canadian Model.
- 220 VAC receptacle on European and Export models for connecting to a water cooler. Protected by 2 amp breaker.
- Single MS-type (14-pin) connection for wire feeder.
- Optional Field Installed Digital or Analog Voltmeter/Ammeter kits are available.
- Optional dual feeder kit for like polarity connection of two wire feeders. Easy panel installation.
- Optional Dual Process Switch for two processes with polarity change and electrical isolation.

WELDING CAPABILITY

The DC-655 has the following Output and Duty Cycle based on operation for a 10 minute period:

650 Amps, 44 Volts at 100%

815 Amps, 44 Volts at 60%

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

CONTROLS AND SETTINGS

All operator controls and adjustments are located on the case front of the DC-655. Refer to Figures B.1, and B.2 and corresponding explanations.

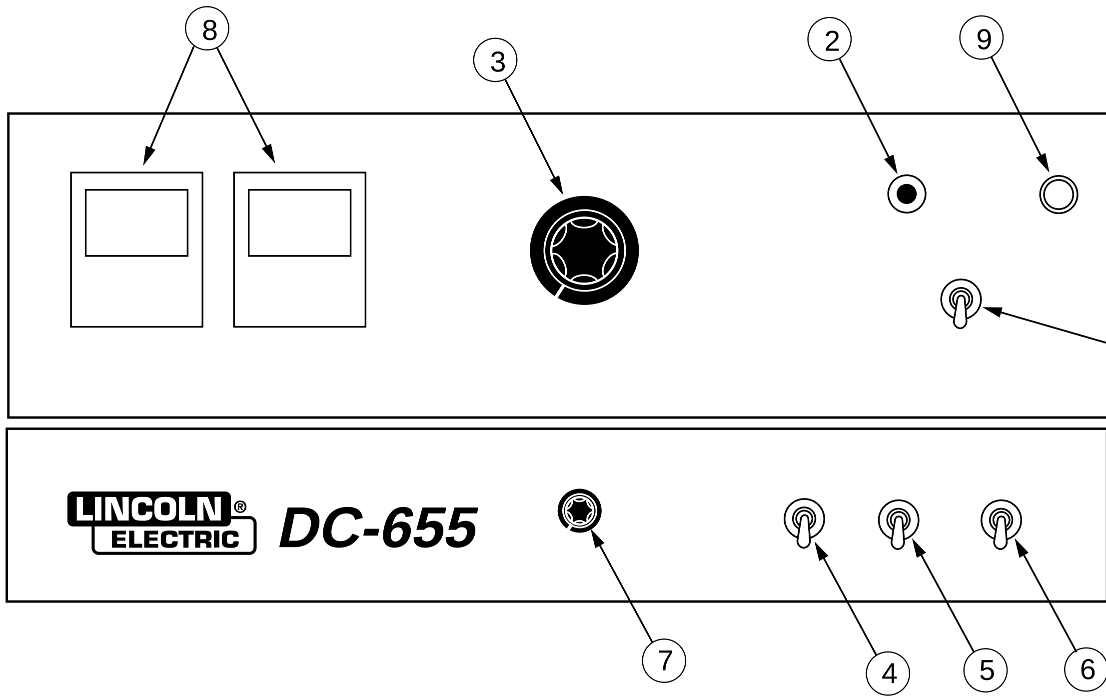


FIGURE B.1 CONTROL PANEL CONTROLS

1. **INPUT POWER ON/OFF SWITCH -** This toggle switch turns the machine on or off. Putting the switch in the ON position energizes the machine's input contactor applying input power to the machine. Switching the switch to the OFF position de-energizes the input contactor. This switch is also used to reset a machine shutdown. (See ***Machine Shutdown*** section)

2. **PILOT LIGHT -** When the power switch is in the ON position the machine's white pilot light will illuminate. If the input contactor de-energizes the machine in a shutdown situation, the pilot will still illuminate. In this situation it will be necessary to reset the machine by switching the power switch to the OFF then ON position. (See ***Machine Shutdown*** section)

3. **OUTPUT CONTROL -** This control provides continuous control of the machine's output from minimum to maximum as it is rotated clockwise. The CV mode voltage range of control is 13 to 44V. The CC mode current range of control is 50 to 815A.

4. **OUTPUT TERMINALS ON/REMOTE -** When this switch is in the REMOTE position, the DC-655's output terminals will be electrically "cold" until a remote device such as a wire feeder closes the #2 and #4 circuit in the MS-receptacle or terminal strip. When this switch is in the ON position the machine's output terminals will be electrically energized all the time.

5. **LOCAL/REMOTE CONTROL SWITCH -** When this switch is set to the LOCAL position, control of the output voltage is via the output control on the DC-655's control panel. When this switch is set to the remote position, control is through a remote source such as a wire feeder via the #75, #76, and #77 leads in the MS-receptacle or terminal strip.

6. **CC STICK/CV SUBARC/CV MIG MODE SWITCH -** This switch selects the proper welding characteristics for the process being used:

   CC Stick provides a constant current output characteristic through the 50 to 815 amp range. The current is adjusted within this range by the Output Control dial. The open circuit (no load) voltage will be about 68 volts in this mode.

   This mode is used for stick welding (SMAW) and CC air carbon-arc gouging, and employs a "Hot Start" feature and an Arc Force Control.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

CC mode may also be used for CC submerged arc with appropriate arc-sensing CC(VV) wire feeders if arc force is set high enough. Refer to ***Welding Performance*** section.

CV MIG provides a constant voltage output characteristic through the 13 to 44 volt range. The voltage is adjusted within this range by the Output Control dial.

The dynamic characteristics of this mode are ideal for open arc processes including, MIG/MAG (GMAW), Innershield®, and other cored wire (FCAW) processes. Faster travel submerged arc processes and CV air carbon-arc gouging may also use this mode. Refer to the ***Welding Performance*** section.

CV Sub-Arc provides the same constant voltage output control range as CV MIG, but the dynamic characteristics of this mode make possible improved CV (constant wire speed) submerged arc welding. This improved process is most noticeable on high deposition slow travel speed welds. Fast travel, narrow bead subarc welds will have better performance in CV MIG mode.

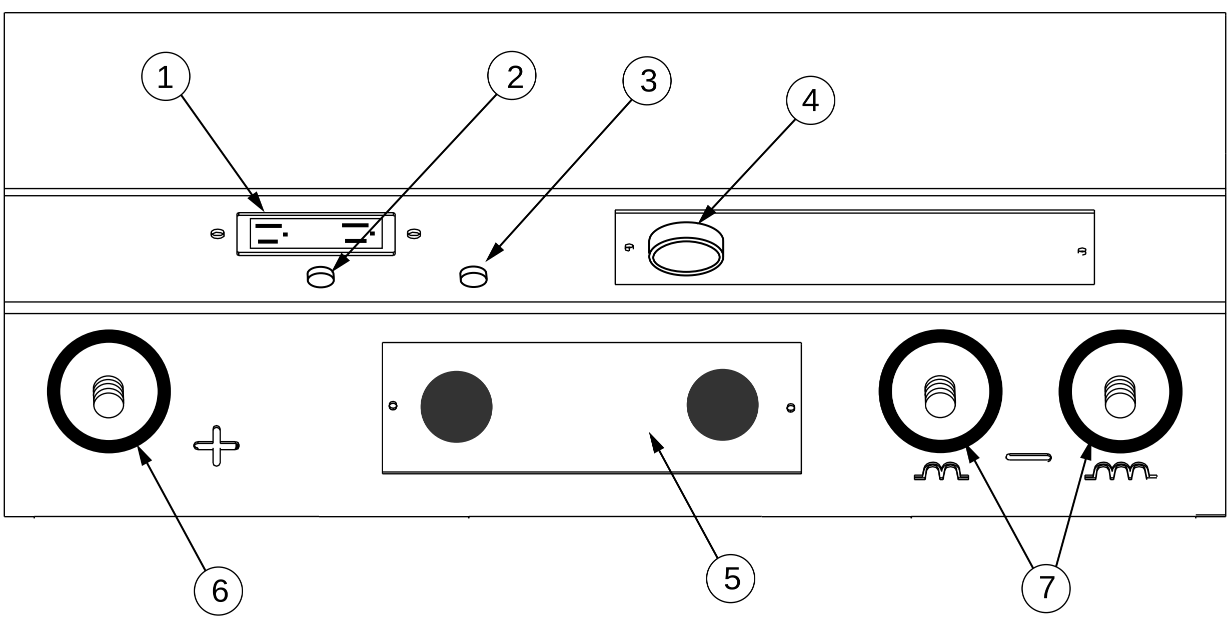
7. **ARC FORCE CONTROL -** This control is only functional in CC Stick mode. It prevents "stubbing" of the electrode by providing the extra weld current that linearly increases as the welding voltage decreases below a level determined by the setting of the constant current control.

   The Arc Force control knob, located behind the latched cover, adjusts arc force from "Min" (no current increase) to "Max" (higher short circuit current). The "mid" position (#5) is recommended for most CC welding. Refer to the ***Welding Performance*** Section.

8. **OPTIONAL VOLTMETER & AMMETER -** Digital or analog meter kits are available as field installed options. Refer to the Accessories Section of this manual.

9. **THERMAL PROTECTION LIGHT** - If the machine overheats due to lack of proper air flow through the machine or due to exceeding the machine's duty cycle, thermostats will disable the welding output and this light will illuminate. Input power is still applied to the machine and the cooling fan will continue to run. When the machine cools the welding output will resume.

FIGURE B.2 LOWER CASE FRONT CONTROLS & CONNECTIONS



1. **115 VAC DUPLEX RECEPTACLE (Domestic and Canadian Models)** This receptacle provides up to 20 amps of 115 VAC auxiliary power on the Domestic Models and up to 15 amps on the Canadian Model.

2. **115 VAC CIRCUIT BREAKER -** This breaker protects the 115 VAC auxiliary circuits located in the duplex receptacle, terminal strip and MS-receptacle. Breaker is rated 20 amps on Domestic Models and 15 amps on all other models.

3. **42 VAC 10 AMP CIRCUIT BREAKER -** This breaker protects the 42 VAC auxiliary circuits located in the terminal strip and MS-receptacle.
4. **14-PIN MS-RECEPTACLE -** This connector provides easy connection for a wire feeder control cable. It provides connections for auxiliary power, output switching, remote output control, wire feeder voltmeter sense lead and ground. Refer to ***14-Pin MS Type Receptacle*** in the Installation Section of this manual for information about the circuits made available at this receptacle.
5. **TERMINAL STRIP COVER PANEL -** Remove this panel to gain access to the circuits made available at the terminal strip and the 4-pin receptacle for the optional paralleling kit. This terminal strip contains the same circuits as the 14-pin MS-receptacle. The cover also provides for installation of cable strain relief clamps.
6. **POSITIVE OUTPUT TERMINAL -** This output terminal is for connecting a welding cable. To change welding polarity and for proper welding cable size refer to ***Electrode and Work Cables*** in the Installation Section of this manual.
7. **NEGATIVE OUTPUT TERMINALS -** These output terminals are for connecting a welding cable to either the High Inductance or Low Inductance Terminal for desired arc characteristics. To change welding polarity and for proper welding cable size refer to ***Electrode and Work Cables*** in the Installation Section of this manual.

CASE BACK CONNECTIONS

220 VAC AUXILIARY RECEPTACLE
(European and Export Models)

This receptacle provides up to 2 amps of 220 VAC auxiliary power for a water cooler.

220 VAC 2 AMP CIRCUIT BREAKER
(European and Export Models)

This breaker protects the 220 VAC auxiliary circuit located in the 220 VAC receptacle.

AUXILIARY POWER

42 volt AC auxiliary power, as required for some wire feeders, is available through the wire feeder receptacle. A 10 amp circuit breaker protects the 42 volt circuit from overloads.

DC-655 machines can also supply 115 volt AC auxiliary power through the wire feeder receptacle. A 20 amp circuit breaker on the Domestic model, and a 15 amp on the Canadian and Export models protects the 115 volt circuit from overloads. 115 VAC is not available in the MS-receptacle on the European models.

CAUTION

Note that some types of equipment, especially pumps and large motors, have starting currents which are significantly higher than their running current. These higher starting currents may cause the circuit breaker to open. If this situation occurs, the user should refrain from using the DC-655 auxiliary power for that equipment.

MACHINE PROTECTION

THERMAL FAN CONTROL

The machine's cooling fan remains off when the temperature of the rectifiers and windings inside the machine are below that requiring air flow cooling, as determined by electronic monitoring of several thermal sensors and the welding current of the machine. Depending upon the operating temperature of the machine, the fan may remain off while welding but once the fan is activated, it will remain on for at least 5 minutes to assure proper cooling. This feature saves energy and also minimizes the amount of dirt and other air borne particles being drawn into the machine.

FAN MOTOR FUSE
(European Model)

A 10 amp slow blow fuse protects the fan motor circuit. This fuse is located inside the DC-655 mounted on the fan motor bracket.

MACHINE SHUTDOWN

The DC-655 provides shutdown modes for thermal over-heating, excessive load currents and faults. It also provides an idle timer shutdown feature for additional operating economy.

Return to Section TOC
Return to Master TOC

THERMAL SHUTDOWN

This welder has thermostatic protection from excessive duty cycles, overloads, loss of cooling, and high ambient temperature. When the welder is subjected to an overload or loss of cooling, a thermostat will open. This condition will be indicated by the illumination of the yellow Thermostatic Protection Light on the case front (see ***Figure B.1***). The fan will continue to run to cool the power source. No welding is possible until the machine is allowed to cool and the Thermostatic Protection Light goes out.

OVER CURRENT PROTECTION SHUTDOWN

Average Current Shutdown

To protect the SCR's , the DC-655 will shut down to essentially no output if the output current averages over 900 amps for about 5-6 seconds, and in less than 0.3 seconds if averaging over 1200 amps (shorter time for higher current). Control PC board LED4, shutdown light, will turn on.

This average current shut down can only be reset by opening the feeder gun trigger, or switching the DC-655 Output/Remote switch out of the “on” position.

Peak Current Shutdown

To protect the SCRs, the DC-655 will shut down immediately to essentially no output if the peak output current exceeds 2500 amps (about 1800A average). Control PC board LED4, shutdown light, will turn on.

This peak current shut down can be reset by turning the DC-655 input power off, then on.

REMOTE CONTROL LEADS FAULT PROTECTION SHUTDOWN[1]

The remote control leads from the 14-pin receptacle or terminal strip are protected against high voltage faults to the electrode circuit or auxiliary voltage supplies. If such a fault occurs, the DC-655 will shut down the input primary voltage to the transformer to prevent the fault output. Control PC board LED3, input shutdown light, turns on.

If this input shutdown occurs the input power pilot light remains lit, since the power switch is ON and control power is still present. Welding output or auxiliary supply output will not be present.

This input shut down is reset by turning the DC-655 input power off, then on. If the fault is not corrected however, the shutdown will re-occur when turning on the input power.

[1] Note on earlier machines: LED4 will turn on and output will be disabled if this fault occurs.

SHORTED RECTIFIER FAULT PROTECTION

If a short occurs across one of the silicon controlled rectifiers of the DC-655, a potentially hazardous AC voltage could appear across the welding output terminals, even in idle mode when no output should be present. If such a fault occurs, the DC-655 will shut down the input primary voltage to the transformer to prevent the fault output. Control PC board LED3, input shutdown light, turns on.

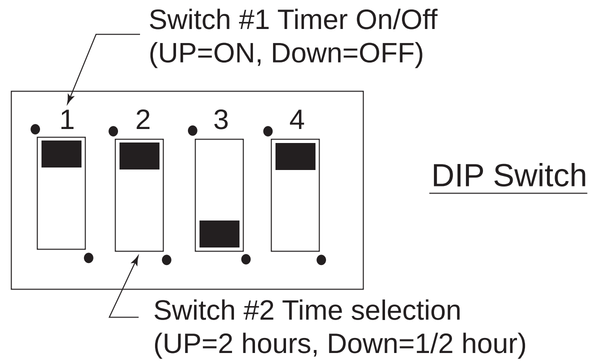
If this input shutdown occurs the input power pilot light remains lit, since the power switch is ON and control power is still present. Welding output or auxiliary supply output will not be present.

This input shut down is reset by turning the DC-655 input power off, then on. If the fault is not corrected however, the shutdown will re-occur when turning on the input power.

IDLE SHUTDOWN TIMER

For additional operating economy, the DC-655 can be set up to automatically shut off the primary input power to the main transformer after a selectable time (1/2 or 2 hr.) has expired without welding. The unexpired timer is reset with each weld.

The idle mode timer is activated by setting Switch #1 (left most) of the DIP Switch located on the lower-center of the DC-655 Control PC board. from the down (Off) position to the up (On) position. Setting Switch #2 of the DIP switch to up (On) sets the shutdown time to 2 hours. Setting Switch #2 of the DIP switch to down (Off) sets the shutdown time to 1/2 hour. Shutdown is reset by turning the DC-655 input power off, then on.



Note: See Weld Performance section for use of switch #3 and #4.

Return to Section TOC
Return to Master TOC

WELDING PERFORMANCE

LOW INDUCTANCE TERMINAL

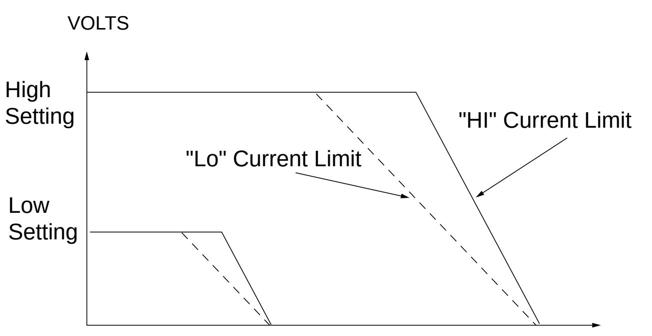
The inside right Negative (-) terminal is lower choke inductance and presently is only recommended for welding with NR203Ni 1% procedures. All other processes are to be welded using the outside right Negative (-) terminal with higher choke inductance.

CV MODE CURRENT-LIMITING

CV MIG and CV Sub-Arc modes employ electronic current limiting to limit excessive short circuit output current which can result in undesirable arc characteristics or nuisance over current protection shutdown (see ***Machine Protection*** section).

As shipped, the DC-655 is set for “Hi” current limiting, which maintains constant voltage until the welding current exceeds a level proportional to the voltage setting, then falls off linearly at about 10 volts per 100 amps to a limited short circuit current. “Lo” current limiting provides the same short circuit current, but the arc voltage begins to linearly fall off at lower current, at about 5 volts per 100 amps.

“Hi” is recommended for all CV processes, especially for CV subarc and CV arc gouging, but “Lo” tends to “soften” the arc more when welding NR203Ni 1% on the Low Inductance (-) terminal. If “Lo” is desired, switch #4(right-most) of the DIP switch located on the lower-center of the DC-655 Control PC board needs to be switched from up (Hi) position to down (Lo) position.

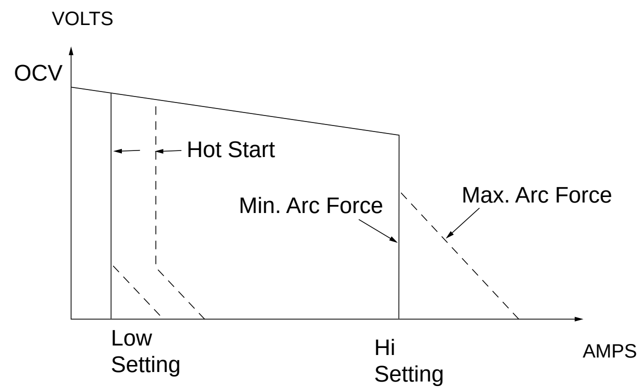


CV OUTPUT

CC MODE ARC FORCE

Arc Force provides extra weld current which linearly increases as the welding voltage decreases below a level determined by the constant current setting. The Arc Force control knob, located behind the latched cover, adjust Arc Force from “Min” (no current increase) to “Max” (about 9A/V increase).

As a general guideline for CC welding, set Arc Force to “Mid” position and increase (typically to no more than #7) as necessary to prevent “stubbing” or “pop-outs” while welding. This higher arc force is recommended especially for low end 6010 stick welding.

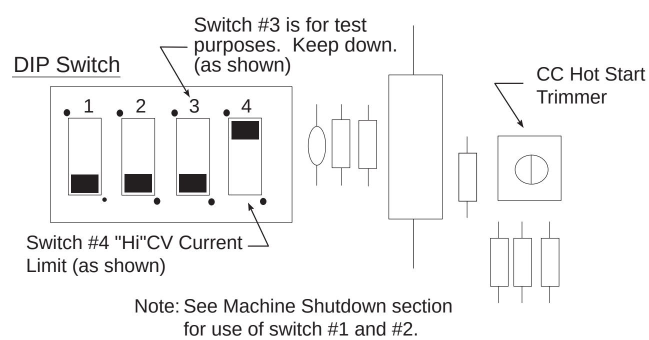


CC OUTPUT

CC MODE HOT START

Hot start is built-in for CC mode stick and carbon arc starting. Hot Start provides an extra weld current “boost” at the arc strike which increases with higher current settings. This Hot Start level exponentially decays to the weld current setting in a few seconds.

Adjustment of the Hot Start shouldn’t be necessary, but an unsealed trimmer (R81) is provided on the DC-655 Control PC Board to adjust hot start. Full counterclockwise adjustment will reduce Hot Start to zero.



DC-655 Control PC Board

CC MODE ARC GOUGING

The DC-655 is rated for air carbon arc gouging with up to 3/8” (10mm) diameter carbons. CC mode gouging is often preferred over CV mode for cutting control, but some Arc Force may be required to avoid carbon stubbing.

TABLE OF CONTENTS
- ACCESSORIES -

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIELD INSTALLED OPTIONS

K1482-1 Digital Ammeter/Voltmeter Kit - Installs easily to the front control panel and provides digital display of actual welding voltage and amperage while welding. (Installation instructions are included with the kit).

K1483-1 Analog Ammeter/Voltmeter Kit - Installs easily to the front control panel and provides analog display of actual welding voltage and amperage while welding. (Installation instructions are included with the kit).

K1484-1 Dual Feeder Kit - This kit replaces the 14-Pin MS-receptacle panel on the lower case front of the DC-655. It provides two 14-Pin MS-receptacles and a built in transfer circuit for connecting and operating two like-polarity wire feeders. European DC-655 models can only use 42V feeders with this kit. (Installation instructions are included with the kit).

K1485-1 Cable Hanger Bracket - Mounts over standard lift bale of the DC-655 and provides a cable hanger on both sides of the power source, each side capable of holding up to 100 ft. of weld cable. (Installation instructions are included with the kit).

K1486-1 Air Filter Kit - Removable metal filter easily slides in and out of a bracket which mounts to the front of the DC-655. Filter is designed to trap 80% of entering particles which are 5 microns, or larger, in size. (Installation instructions are included with the kit). Cannot be used with K1528-1 Dual process switch.

NOTE: A dirty air filter may cause the thermal protection of the DC-655 to prematurely activate. Remove and blow out, or wash and dry, the filter every two months, or less if in extremely dirty conditions. Replace if necessary.

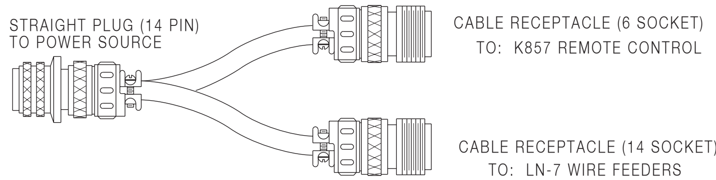
Undercarriage (K817P, K842) - The DC-655 is designed for use with the Lincoln K817P or K842 Undercarriage. Complete installation instructions are included with each undercarriage. When any of the undercarriages are installed, the DC-655 lift bail is no longer functional. Do not attempt to lift the machine with the undercarriage attached. The undercarriage is designed for moving the machine by hand only. Mechanized towing can lead to injury and /or damage to the DC-655.

REMOTE OUTPUT CONTROL
(K775 OR K857 WITH K864 ADAPTER)

An optional "remote output control" is available. This is the same remote control that is used on other Lincoln power sources (K775). The K775 consists of a control box with 28 ft (8.5m) of four conductor cable. This connects to terminals 75, 76, and 77 on the terminal strip and the case grounding screw so marked with the symbol ⏚ on the machine. These terminals are located behind the cover panel on the lower connection panel of the DC-655. This control will give the same control as the output control on the machine.

The K857 has a 6-pin MS-style connector. The K857 requires a K864 adapter cable which connects to the 14-pin connector on the DC-655.

REMOTE CONTROL ADAPTER CABLE (K864)



A "V" cable 12" (.30m) long to connect a K857 Remote Control (6 pin connector) with a wire-feeder (14-pin connector) and the machine (14-pin connector). If a remote control is used alone the wire-feeder connection is then not used.

K1528-1 Dual Process Switch - (Cannot be used with K1486-1 Air Filter Kit) The Dual-Process Switch mounts easily to the front of the machine and is designed to provide a selection between left and right side output terminals. Each pair of output terminals can be switched to either the DC-655, high or low inductance terminals as desired. Wire feed unit cables and air carbon arc cables can be connected to either or both sides of the box and with proper connection can provide polarity change with just a switch change. Selecting one side only energizes those output studs and opens the other side. Installation instructions are included with the switch.)

K1611-1 Paralleling Kit - Provides interconnection of two DC-655 machines in parallel for doubling the current capacity of one machine. This "master" and "slave" connection configuration allows the "master" to control the balanced output of both machines. Individual protection circuits of both machines function normally. (Installation instructions are included with the switch.)

Return to Section TOC
Return to Master TOC

The DC-655 can be used to power any of the following Lincoln Wire feeders:

SEMI-AUTOMATIC WIRE FEEDERS

- DH-10
- LN-10
- LN-7 GMA*
- LN-742
- LN-7*
- LN-9*
- LN-9 GMA*
- LN-23P
- LN-25
- LN-8*

AUTOMATIC WIRE FEEDERS*

- NA-3
- NA-5
- NA-5R
- LT-7 Tractor

* European DC-655 models only provide 115VAC for these feeders at the terminal strip (TS2)

CONNECTION OF LINCOLN ELECTRIC AUTOMATIC OR SEMIAUTOMATIC WIRE FEEDERS

⚠ WARNING



ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.
- Do not touch electrically hot parts.

Auxiliary power for wire feeder operation is available at both a 14-pin MS receptacle and at terminal strips with screw-type connections located on the front of the machine. Refer to the ***Installation*** section for pinouts and lead designations. The two circuits are isolated, and each is protected by a circuit breaker.

The following descriptions show how to connect the wire feeders using either the 14-pin MS receptacle or the terminal strip.

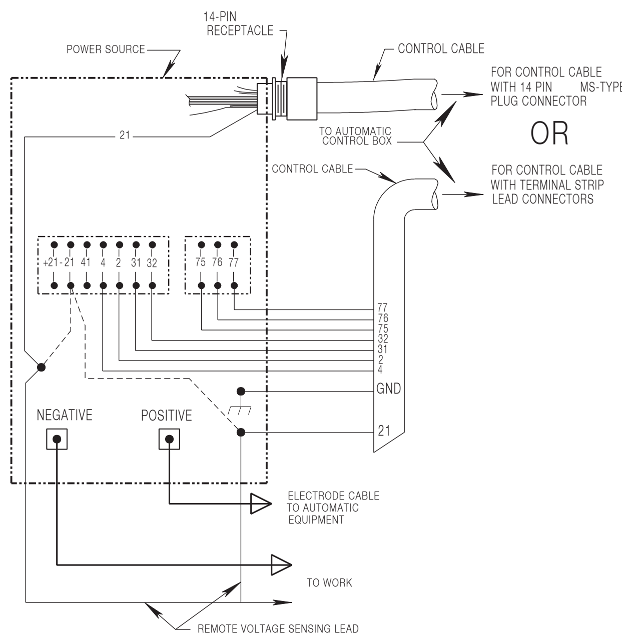
AUTOMATIC WIRE FEEDERS

CONNECTING THE NA-3 OR LT-7 TO THE IDEALARC DC-655 (TERMINAL STRIP)

1. Set Idealarc DC-655 POWER toggle switch to the OFF (0) position.
2. Disconnect main AC input power to the Idealarc DC-655.
3. Connect the wire feeder control cable leads to the Idealarc DC-655 terminal strip as shown in Figure C.1.
4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚ .

NOTE: The Idealarc DC-655 must be properly grounded.

FIGURE C.1 – NA-3 OR LT-7 WIRE FEEDER CONNECTION TO THE IDEALARC DC-655



5. Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.
   a. Make a bolted connection using AWG #14 or larger insulated wire. Tape the bolted connection with insulating tape.
   b. An S-16586- X remote voltage sensing work lead is available for this purpose.
   c. Keep the #21 lead electrically separate from the work cable circuit and connection.
   d. Tape the #21 lead to work cable for ease of use.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

NOTE: The connection diagram shown in Figure C.1 shows the electrode connected for positive polarity. To change polarity:

a. Set the Idealarc DC-655 POWER toggle switch to the OFF (0) position.

b. Move the electrode cable to the negative (-) output terminal. (High inductance or low inductance, as needed).

c. Move the work cable to the positive (+) output terminal.

d. If connecting lead #21 to the terminal strip, connect it to the +21 terminal (to match **work** polarity). If work polarity changes back to negative, lead #21 must be connected to the -21 terminal.

e. Reverse the leads on the back of the ammeter and voltmeter in the automatic control box.

f. If the automatic controls include a variable voltage board, connect its jumper lead to pin “L”. This will permit the inch down button to operate. However, the jumper also disables the cold starting/autostop feature of the automatic controls. Only hot starting will be available.

6. Set the DC-655 OUTPUT CONTROL switch to the “Remote” position and the OUTPUT TERMINALS switch in the “Remote” position.

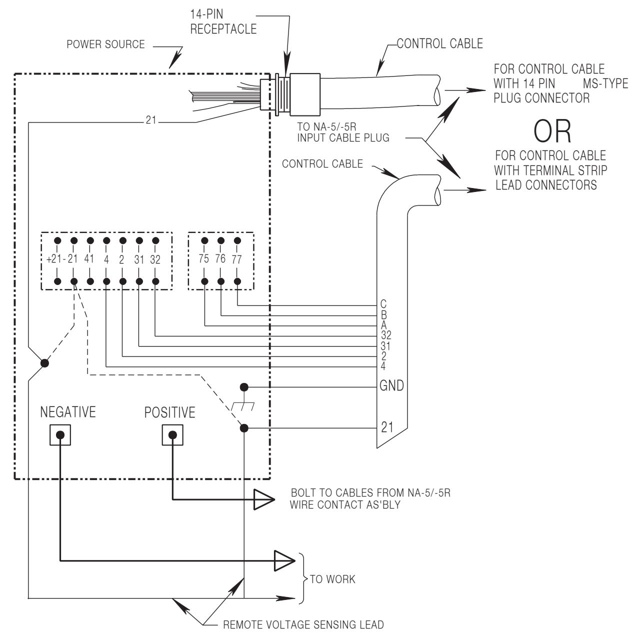
CONNECTING THE NA-5/-5R TO THE IDEALARC DC-655 (TERMINAL STRIP)

1. Set the Idealarc DC-655 POWER toggle switch to the OFF (0) position.

2. Disconnect main AC input power to the Idealarc DC-655.

3. Connect the wire feeder control cable leads to the Idealarc DC-655 terminal strip as shown in Figure C.2.

FIGURE C.2 – NA-5/-5R WIRE FEEDER CONNECTION TO THE IDEALARC DC-655



4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚ .

   NOTE: The Idealarc DC-655 must be properly grounded.

5. Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.

   a. Make a bolted connection using AWG #14 or larger insulated wire. Tape the bolted connection with insulating tape.

   b. An S-16586-X remote voltage sensing work lead is available for this purpose.

   c. Keep the #21 lead electrically separate from the work cable circuit and connection.

   d. Tape the #21 lead to work cable for ease of use.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

6. Connect NA-5/-5R wire feeder control jumpers on Voltage Control Board. See NA-5/-5R Operator's Manual.

NOTE: The connection diagram shown in ***Figure C.2*** shows the electrode connected for positive polarity. To change polarity:

a. Set the Idealarc DC-655 POWER toggle switch to the OFF (0) position.

b. Move the electrode cable to the negative (-) output terminal. (High inductance or low inductance as needed).

c. Move the work cable to the positive (+) output terminal.

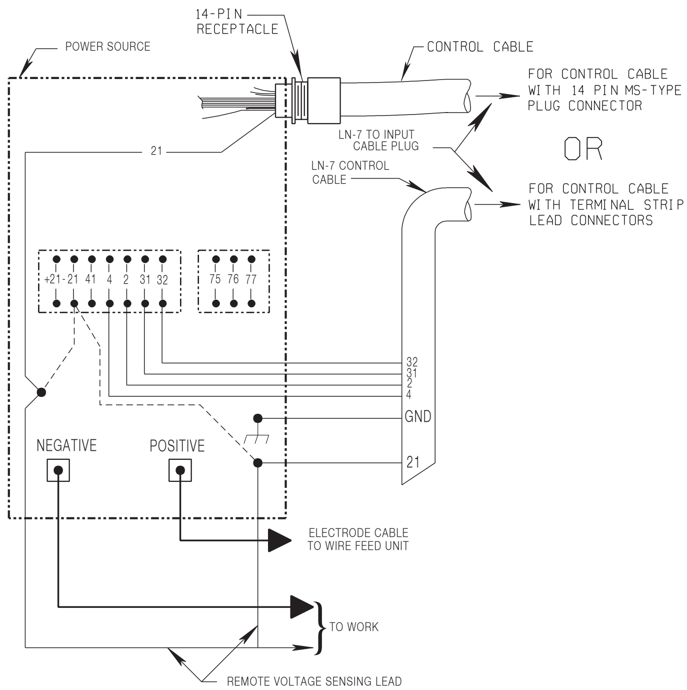
d. If connecting lead #21 to the terminal strip, connect it to the +21 terminal (to match work polarity). If work polarity changes back to negative, lead #21 must be connected to the -21 terminal.

NOTE: For proper NA-5 operation, the electrode cables must be secured under the clamp bar on the left side of the NA-5 Control Box.

7. Set the DC-655 OUTPUT CONTROL switch to the "Remote" position and the OUTPUT TERMINALS switch to the "Remote" position.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE C.3
IDEALARC DC-655/LN-7 WITH K584 INPUT CABLE ASSEMBLY CONNECTION DIAGRAM



SEMIAUTOMATIC WIRE FEEDERS

CONNECTING THE LN-7 TO THE IDEALARC DC-655 (14-PIN MS RECEPTACLE)

1. Set the POWER toggle switch to the OFF (0) position.
2. Disconnect main AC input power to the Idealarc DC-655.
3. Connect the electrode cable from the control cable to the "+" terminal of the welder and to the LN-7 wire feeder. Connect the work cable to the "-" terminal of the welder (High inductance or low inductance as needed). Reverse this hookup for negative polarity.

NOTE: Welding cable must be sized for the current and duty cycle of the application.

4. Connect control cable between the DC-655 and the LN-7. See Figure C.3.
5. Set the MODE switch to a CV (constant voltage) position at the welder.
6. Adjust wire feed speed at the LN-7 and set the welding voltage with the output CONTROL.

NOTE: If optional remote control is used, place the OUTPUT CONTROL and the OUTPUT TERMINALS switch in the "Remote" position.

Return to Section TOC
Return to Master TOC

CONNECTING THE LN-7 TO THE IDEALARC DC-655 (TERMINAL STRIP)

1. Set the Idealarc DC-655 POWER toggle switch to the OFF (0) position.
2. Disconnect main AC input power to the Idealarc DC 655.
3. Connect the wire feeder control cable leads to the Idealarc DC-655 terminal strip as shown in ***Figure C.3.***
4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚ .

NOTE: The Idealarc DC-655 must be properly grounded.

5. PERFORM THIS STEP ONLY IF THE LN-7 IS EQUIPPED WITH A METER KIT.

   Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.

   a. Make a bolted connection using AWG #14 or larger insulated wire. Tape the bolted connection with insulating tape.

NOTE: If the work cable length is less than 25 feet and the connections to the work piece are secure, then wire feeder control cable lead #21 can be connected directly to the DC-655 terminal strip.

   b. An S-16586-X remote voltage sensing work lead is available for this purpose.

   c. Keep the #21 lead electrically separate from the work cable circuit and connection.

   d. Tape the #21 lead to work cable for ease of use.

NOTE: The connection diagram shown in Figure C.3 shows the electrode connected for positive polarity. To change polarity:

a. Set the IDEALARC DC-655 POWER toggle switch to the OFF (0) position.

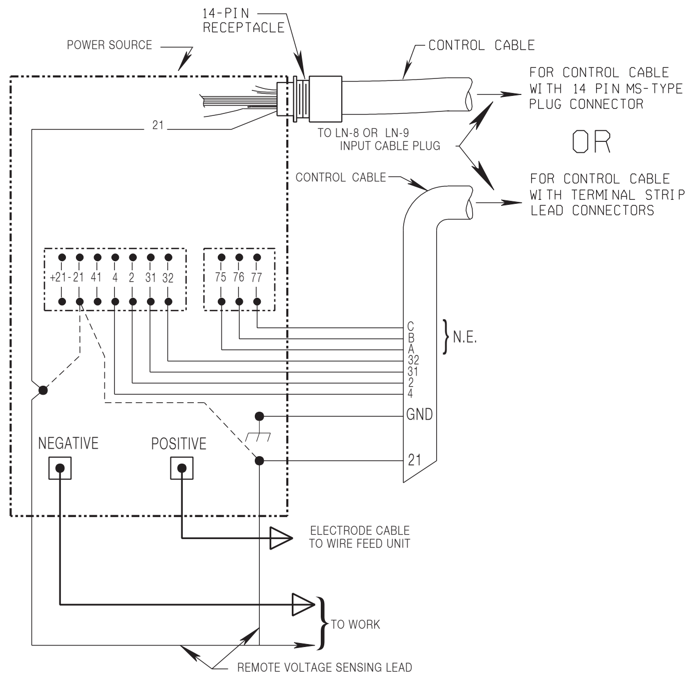
b. Move the electrode cable to the negative (-) output terminal (High inductance or low inductance as needed).

c. Move the work cable to the positive (+) output terminal.

d. Connect control cable lead #21 to “+21” on the terminal strip.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE C.4 - LN-8 OR LN-9 WIRE FEEDER CONNECTION TO THE IDEALARC DC-655



CONNECTING THE LN-8 OR LN-9 TO THE IDEALARC DC-655 (TERMINAL STRIP)

1. Set the Idealarc DC-655 POWER toggle switch to the OFF (0) position.
2. Disconnect main AC input power to the Idealarc DC-655.
3. Connect the wire feeder control cable leads to the Idealarc DC-655 terminal strip as shown in Figure C.4.
4. Connect the wire feeder control cable ground lead to the frame terminal marked ⏚ .
5. Extend wire feeder control cable lead #21 so it can be connected directly to the work piece.
   a. Make a bolted connection using AWG #14 or larger insulated wire. Tape the bolted connection with insulating tape.
   b. An S-16586- X remote voltage sensing work lead is available for this purpose.
   c. Keep the #21 lead electrically separate from the work cable circuit and connection.
   d. Tape the #21 lead to work cable for ease of use.
6. Connect LN-9 wire feeder control jumpers on Voltage Control board. See LN-9 Operator's Manual.

NOTE: The connection diagram shown in Figure C.4 shows the electrode connected for positive polarity. To change polarity:

   a. Set the Idealarc DC-655 POWER toggle switch to the OFF (0) position.
   b. Move the electrode cable to the negative (-) output terminal (High inductance or low inductance as needed).
   c. Move the work cable to the positive (+) output terminal.
   d. Connect control cable lead #21 to "+21" on the terminal strip.

7. Set the OUTPUT CONTROL switch to the "Remote" position and the OUTPUT TERMINALS switch to the "Remote" position.

Return to Section TOC
Return to Master TOC

CONNECTING THE LN-8 OR LN-9 TO THE IDEALARC DC-655 (14-PIN MS RECEPTACLE)

1. Set the POWER toggle switch to the OFF (0) position.
2. Disconnect main AC input power to the Idealarc DC-655.
3. Connect the electrode cable from the LN-8 or LN-9 to the "+" terminal of the welder. Connect the work cable to the "-" terminal of the welder (High inductance or low inductance as needed). Reverse this hookup for negative polarity. See ***Figure C.4.***

NOTE: Welding cable must be sized for the current and duty cycle of the application.

4. Connect the control cable between the 14-pin MS receptacle on the DC-655 and the input cable plug on the LN-8 or LN-9. See ***Figure C.4***.
5. Set the MODE switch to a CV (constant voltage) position.
6. Adjust wire feed speed at the LN-8 or LN-9 and set the welding voltage with the WIRE FEEDER VOLTAGE CONTROL.

Place the OUTPUT CONTROL switch in the "Remote" position and the OUTPUT TERMINALS switch in the "Remote" position.

CONNECTING THE DH-10 TO THE IDEALARC DC-655 (14-PIN MS RECEPTACLE)

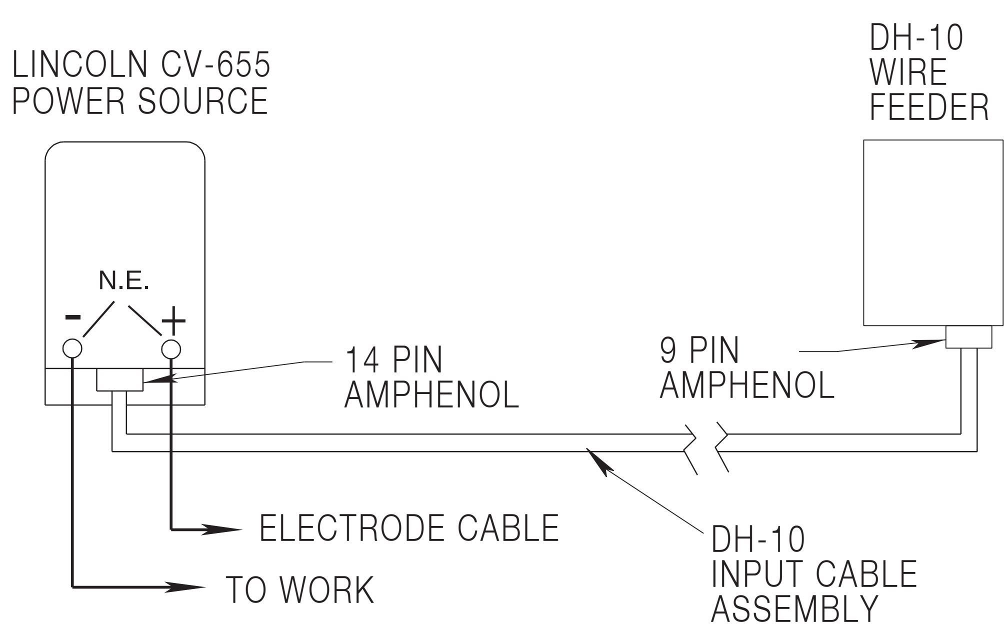
1. Set the POWER toggle switch to the OFF (0) position.
2. Disconnect main AC input power to the Idealarc DC-655.
3. Connect the electrode cable from the DH-10 to the "+" terminal of the welder. Connect the work cable to the "-" terminal of the welder (High inductance or low inductance as needed). Reverse this hookup for negative polarity.

NOTE: Welding cable must be sized for the current and duty cycle of the application.

4. Connect the DH-10 input cable between the 14-pin MS receptacle on the DC-655 and the input cable plug on the DH-10. See Figure C.5.
5. Set the MODE switch to a CV (constant voltage) position.
6. Adjust wire feed speed at the DH-10 and set the welding voltage with the WIRE FEEDER VOLTAGE CONTROL.
7. Set the DIP switches on the DH-10 for DC-655. See the DH-10 Operator's Manual.

Place the OUTPUT CONTROL switch in the "Remote" position and the OUTPUT TERMINALS switch in the "Remote" position.

FIGURE C.5 – IDEALARC DC-655 DH-10 CONNECTION



NOTES

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

TABLE OF CONTENTS
-MAINTENANCE-

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SAFETY PRECAUTIONS

⚠ WARNING



ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this maintenance.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.
- Do not touch electrically hot parts.

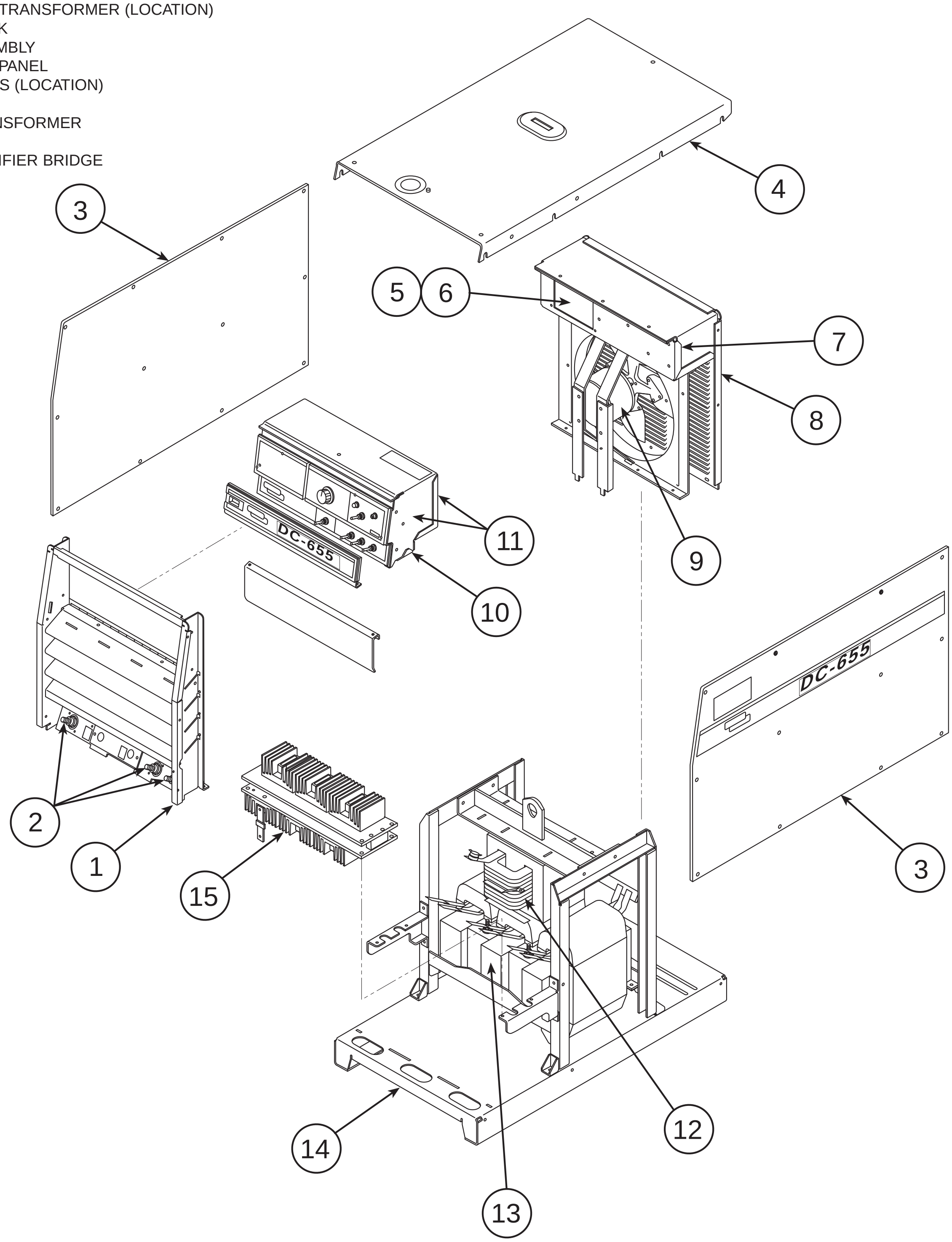
GENERAL MAINTENANCE

1. The fan motor has sealed bearings which require no service.
2. In extremely dusty locations, dirt may restrict the cooling air causing the welder to run hot with premature tripping of thermal protection. Blow ou;the welder with low pressure air at regular intervals to eliminate excessive dirt and dust build-up on internal parts.
3. Periodically check the welding cables. Inspect for any slits or punctures. Also make sure that all connections are tight.

Return to Section TOC
Return to Master TOC

FIGURE D.1 - GENERAL COMPONENT LOCATIONS

1. CASE FRONT
2. OUTPUT TERMINALS
3. CASE SIDES
4. CASE TOP
5. RECONNECT PANEL (LOCATION)
6. INPUT CONTACTOR (LOCATION)
7. CONTROL TRANSFORMER (LOCATION)
8. CASE BACK
9. FAN ASSEMBLY
10. CONTROL PANEL
11. PC BOARDS (LOCATION)
12. CHOKE
13. MAIN TRANSFORMER
14. BASE
15. SCR RECTIFIER BRIDGE

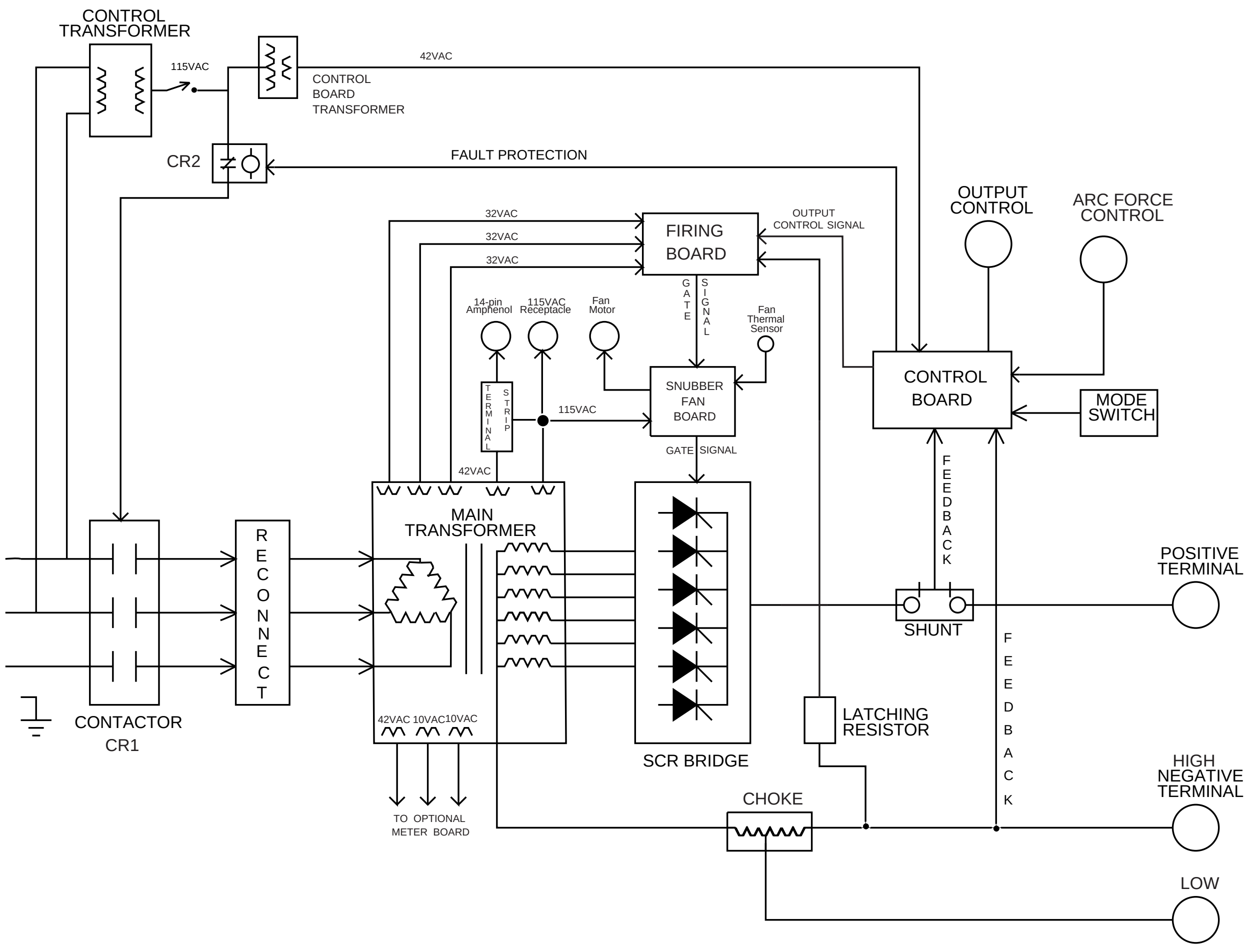


NOTES

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

TABLE OF CONTENTS
-THEORY OF OPERATION SECTION-

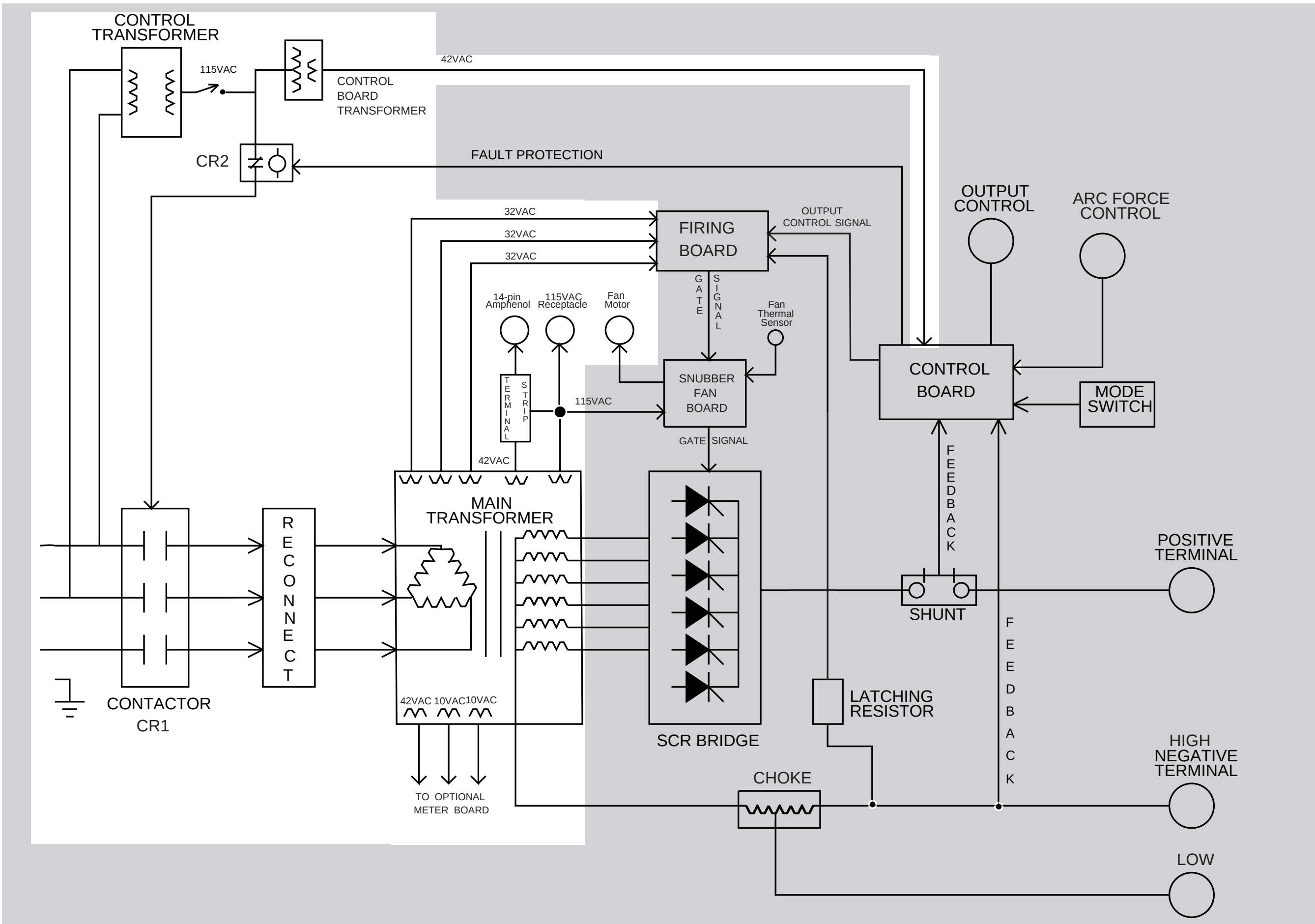
FIGURE E.1 – DC-655 BLOCK LOGIC DIAGRAM



LINCOLN ELECTRIC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE E.2 – INPUT LINE VOLTAGE, CONTACTOR, RECONNECT, FAULT PROTECTION, MAIN AND CONTROL TRANSFORMERS



GENERAL DESCRIPTION

The DC-655 is a three-phase, SCR controlled DC power source. It is capable of either constant current or constant voltage output. It is rated at 650 amps, 100% duty cycle with outstanding arc characteristics for multiple welding processes.

INPUT LINE, CONTACTOR, RECONNECT, FAULT PROTECTION AND TRANSFORMERS

The desired three-phase input power is connected to the DC-655 through an input contactor located in the input box at the rear of the machine. Two phases of the input line are also connected to the control transformer. The secondary of the control transformer supplies 115 VAC power to the control board transformer and to the input contactor through the fault protection relay. The control board transformer supplies 42 VAC to the control board.

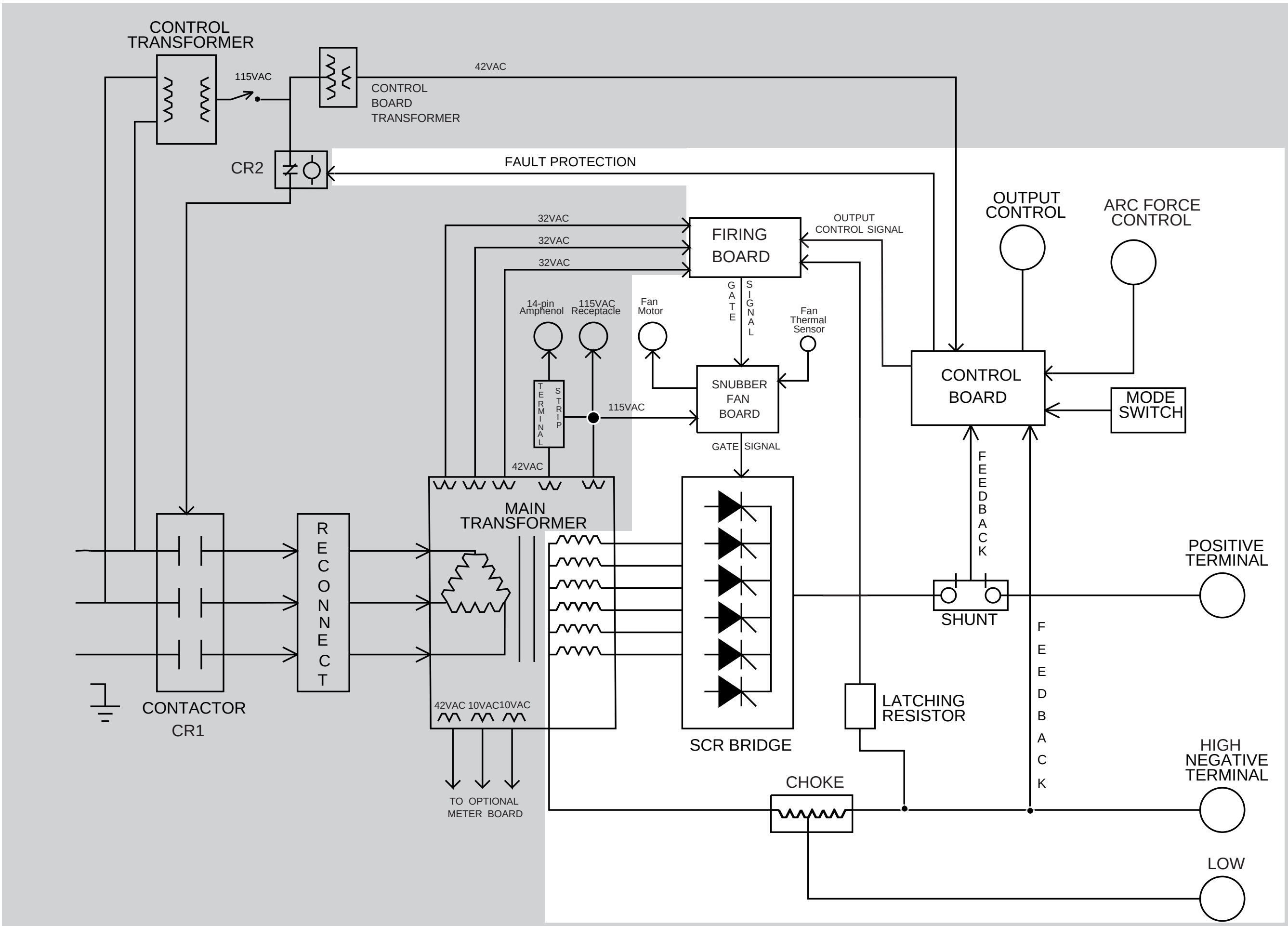
A reconnect panel allows the user to configure the machine for the desired input voltage. This three-phase AC input is applied to the primary of the main transformer. The transformer changes the high voltage, low current input power to a lower voltage, higher current output. The finishes or “neutrals” of the main secondary coils are connected together, and the six starts of the secondary windings are connected to the rectifier assembly.

In addition, the main transformer also has eight isolated secondary windings. There are three 32 VAC windings, which provide power and “timing” to the firing board. The 115 VAC winding powers the fan motor and provides the user with up to 20 amps of 115 VAC auxiliary power at the receptacle or 14-pin MS type connector. The 42 VAC winding provides up to 10 amps at the 14-pin MS type connector. Three other isolated coils are used to power the optional digital meter PC board. One winding is rated at 42 VAC, and the other two are each rated at 10 VAC.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE E.3 – CONTROL BOARD, FIRING BOARD, SNUBBER/FAN BOARD AND RECTIFICATION



CONTROL BOARD, FIRING BOARD, SNUBBER/FAN, BOARD AND RECTIFICATION

The “neutrals” of the welding secondary windings in the main transformer are connected together, and the six starts are connected to the six Silicon Controlled Rectifier (SCR) assemblies to form a six-phase output. This six-phase AC output from the main transformer secondary is rectified and controlled through the SCR bridge.

A portion of the firing board is a three-phase circuit. Each phase provides two firing pulses, one for each of the two SCRs controlled by that phase. When a gate firing enable signal is received, the firing circuit supplies the proper amount of energy to the gates of the power SCRs. When this gate firing signal is applied at the correct time, through the snubber/fan board, the SCR will turn ON. The amount of ON time versus OFF time determines the output of the machine. See ***SCR Operation.*** At this time the latching resistor is brought into the machine’s output circuit. The latching resistor provides a pre-load for the SCR bridge.

The control board receives current feedback information from the shunt and voltage feedback information from the choke and welding output terminals. This feedback information is processed on the control board. The control compares the commands of the mode switch, the output control potentiometer (or remote control device) and the arc force control with the feedback information and sends the appropriate output control signal to the firing board. In the event of a “fault condition,” the control board activates the fault relay (CR2). See ***Protective Devices and Shut Down Circuits.***

A tapped output choke is connected between the neutral connection of the main transformer secondaries and the two negative output terminals. This large inductor stores energy, which provides current filtering for the welding output of the DC-655. Two negative output terminals are provided. One is connected to the tap lead in the choke, thus providing a lower inductance. The other utilizes the entire choke for higher inductance arc characteristics.

The snubber/fan board furnishes protection to the SCR bridge from the transient voltages. It also monitors the thermal sensor and activates the fan motor when cooling is necessary.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

Return to Section TOC Return to Master TOC
Return to Section TOC Return to Master TOC
Return to Section TOC Return to Master TOC
Return to Section TOC Return to Master TOC

PROTECTIVE DEVICES AND SHUTDOWN CIRCUITS

THERMAL PROTECTION

Two thermostats protect the DC-655 from excessive operating temperatures. Excessive operating temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperatures should occur, a thermostat will open. This condition will be indicated by the illumination of the yellow Thermostatic Protection Light located on the case front. The fan should continue to run, but the welding output will be disabled until the machine cools and the Thermostatic Protection Light is out.

OVER CURRENT PROTECTION

If the average output current exceeds 900 amps for five to six seconds, the welding output will be disabled. The control board LED 4 shutdown light will turn on. The higher the current, the quicker the DC-655 will shut down. If the average current exceeds 1200 amps, the shutdown will occur in 0.3 seconds. The over current shutdown circuit can be reset by opening the feeder gun trigger or switching the DC-655 output terminal switch to the OFF position.

PEAK CURRENT PROTECTION

If the peak current exceeds 2500 amps, the welding output will be disabled and the control board LED 4 shutdown light will turn on. The peak current shutdown circuit can be reset by turning the DC-655 input switch off.

REMOTE CONTROL FAULT PROTECTION

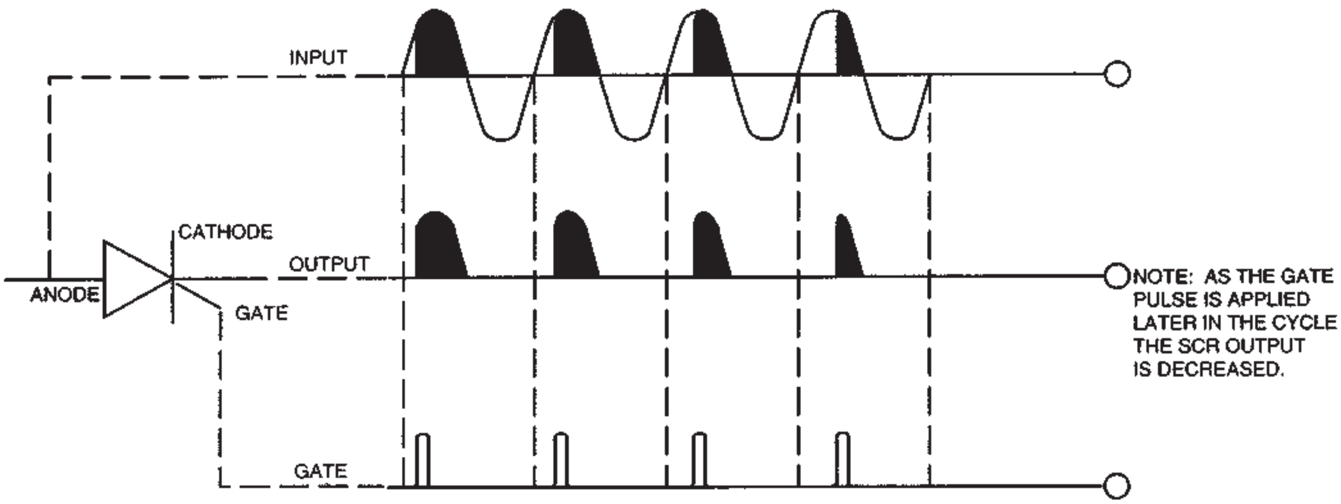
The remote control leads from the 14-pin receptacles or terminal strip are protected against voltage faults to the electrode circuit or auxiliary voltage supplies. If a fault should occur, the welding output will be disabled and the control board LED 4 shutdown light will turn on. This fault protection shutdown circuit can be reset by opening the feeder gun trigger or switching the DC-655 output terminal switch to the OFF position. On later production machines, LED 3 input shutdown light will turn on and the input contactor will open.

SHORTED OUTPUT RECTIFIER FAULT PROTECTION

If a short should occur across one of the SCRs, a potentially hazardous AC voltage could appear across the welding output terminals. If such a fault should occur, the input contactor will open and remove the input power to the primary of the main transformer. Also, the control board LED 3 input shutdown light will turn on. Welding and auxiliary output will not be present, but the pilot light and control board power will be present until the power switch is turned off.

Return to Section TOC Return to Master TOC

FIGURE E.4 – SCR OPERATION



SCR OPERATION

A silicon controlled rectifier (SCR) is a three-terminal device used to control rather large currents to a load. An SCR acts very much like a switch. When a gate signal is applied to the SCR, it is turned ON and there is current flow from anode to cathode. In the ON state the SCR acts like a closed switch. When the SCR is turned OFF, there is no current flow from anode to cathode. Thus the device acts like an open switch. As the name suggests, the SCR is a rectifier, so it passes current only during positive half cycles of the AC supply. The positive half cycle is the portion of the sine wave in which the anode of the SCR is more positive than the cathode.

When an AC supply voltage is applied to the SCR, the device spends a certain portion of the AC cycle time in the ON state and the remainder of the time in the OFF state. The amount of time spent in the ON state is controlled by the Gate.

An SCR is fired by a short burst of current into the gate. This gate pulse must be more positive than the cathode voltage. Since there is a standard PN junction between gate and cathode, the voltage between these terminals must be slightly greater than 0.6V. Once the SCR has fired, it is not necessary to continue the flow of gate current. As long as current continues to flow from anode to cathode, the SCR will remain on. When the anode to cathode current drops below a minimum value, called holding current, the SCR will shut off. This normally occurs as the AC supply voltage passes through zero into the negative portion of the sine wave. If the SCR is turned on early in the positive half cycle, the conduction time is longer, resulting in greater SCR output. If the gate firing occurs later in the cycle, the conduction time is less, resulting in lower SCR output.

NOTES

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

TABLE OF CONTENTS
TROUBLESHOOTING & REPAIR SECTION

HOW TO USE TROUBLESHOOTING GUIDE

WARNING

Service and repair should be performed by only Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

Step 1. LOCATE PROBLEM (SYMPTOM). Look under the column labeled "PROBLEM (SYMPTOMS). This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into three main categories: Output Problems, Function Problems and Welding Problems.

Step 2. PERFORM EXTERNAL TESTS. The second column, labeled "POSSIBLE AREAS OF MISADJUSTMENT(S)", lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case wrap-around cover.

Step 3. PERFORM COMPONENT TESTS. The last column, labeled "Recommended Course of Action" lists the most likely components that may have failed in your machine. It also specifies the appropriate test procedure to verify that the subject component is either good or bad. If there are a number of possible components, check the components in the order listed to eliminate one possibility at a time until you locate the cause of your problem.

All of the referenced test procedures referred to in the Troubleshooting Guide are described in detail at the end of this chapter. Refer to the Troubleshooting and Repair Table of Contents to locate each specific Test Procedure. All of the referred to test points, components, terminal strips, etc., can be found on the referenced electrical wiring diagrams and schematics. Refer to the Electrical Diagrams Section Table of Contents to locate the appropriate diagram.

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC

PC BOARD TROUBLESHOOTING PROCEDURES

WARNING



ELECTRIC SHOCK can kill.

- Have an electrician install and service this equipment. Turn the input power OFF at the fuse box before working on equipment. Do not touch electrically hot parts.

CAUTION

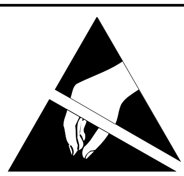
Sometimes machine failures appear to be due to PC board failures. These problems can sometimes be traced to poor electrical connections. To avoid problems when troubleshooting and replacing PC boards, please use the following procedure:

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.

2. Check for loose connections at the PC board to assure that the PC board is properly connected.

3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock. Read the warning inside the static resistant bag and perform the following procedures:

PC board can be damaged by static electricity.



ATTENTION
Static-Sensitive Devices
Handle only at Static-Safe Workstations

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.

- If you don't have a wrist strap, touch an un-painted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.

- Tools which come in contact with the PC board must be either conductive, anti-static or static-dissipative.

- Remove the PC board from the static-shielding bag and place it directly into the equipment. Don't set the PC board on or near paper, plastic or cloth which could have a static charge. If the PC board can't be installed immediately, put it back in the static-shielding bag.

- If the PC board uses protective shorting jumpers, don't remove them until installation is complete.

- If you return a PC board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.

4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

NOTE: It is desirable to have a spare (known good) PC board available for PC board troubleshooting.

NOTE: Allow the machine to heat up so that all electrical components can reach their operating temperature.

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.

   a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.

   b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.

6. Always indicate that this procedure was followed when warranty reports are to be submitted.

NOTE: Following this procedure and writing on the warranty report, "INSTALLED AND SWITCHED PC BOARDS TO VERIFY PROBLEM," will help avoid denial of legitimate PC board warranty claims.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is evident.	1. Contact the Lincoln Electric Service Dept. 1-800-833-9353.	
The machine is dead - the input contactor does not operate. The pilot light is not lit.	1. The power switch (S1) is in the ON position. 2. Check for blown or missing fuses in the input lines. 3. Check the three-phase input line voltage at the machine. The input voltage must match the rating plate and reconnect panel.	1. Check the power switch (S1) and associated leads and connections. See the ***Wiring Diagram.*** 2. Perform the ***Control Transformer Test.***
The input contactor operates, but no welding output. The 115 VAC auxiliary supply is present at the receptacle.	1. Check the electrode and work cables for loose or faulty connections. 2. If the Thermal Protection Light is ON, the machine is overheated. Wait for the machine to cool and remedy the cause of the overheating problem. See the ***Fan/Snubber Board LED Chart.*** 3. Make certain either the output terminals switch is in the ON position or the external gun trigger circuit is functioning properly.	1. Perform the ***Internal Trigger Circuit Test.*** 2. Perform the ***Firing Board Test.*** 3. Perform the ***Main Transformer Test.*** 4. Perform the ***SCR Output Bridge Test.*** 5. The control board may be faulty. See ***Control Board LED Chart.***

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The input contactor chatters.	1. Check the three-phase input line voltage at the machine. The input voltage must match the rating plate and reconnect panel configuration.	1. Check for loose or faulty wiring between the input power switch (SW1), the fault protection relay (CR2) and the input contactor. See the Wiring Diagram. 2. The fault protection relay (CR2) may have defective contacts. Check or replace. 3. The control board may be defective. See the ***Control Board LED Chart.*** 4. The input contactor may be faulty.
The machine is dead - the input contactor does not operate. The pilot light is lit.	1. Check the three-phase input line voltage at the machine. The input voltage must match the rating plate and reconnect panel configuration. 2. Turn the machine off and then back on to reset the fault protection circuit. See the ***Control Board LED Chart.***	1. Check the wiring between the fault protection relay (CR2) and the input contactor (CR1). 2. The fault protection relay (CR2) may have defective contacts. Check or replace. 3. The input contactor may be faulty.

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC Return to Master TOC

TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The machine has welding output but no control.	1. Check the output control switch (SW3) for proper setting. 2. If a remote control cable is used, make certain the cable and connections are good.	1. The output control potentiometer, output control switch (SW3) or associated wiring may be defective. See the Wiring Diagram. 2. Perform the ***Firing Board Test.*** 3. Perform the ***SCR Output Bridge Test.*** 4. The control board may be faulty. See the ***Control Board LED Chart.***
The machine does not have maximum output.	1. Check the three-phase input lines at the DC-655. Make certain the input voltages match the machine's rating and reconnect panel configuration. 2. Put the output control switch (SW3) in the "Local" control position. If the problem is resolved, the remote unit or wire feeder may be defective.	1. The output control potentiometer, output control switch (SW3) or associated wiring may be defective. See the Wiring Diagram. 2. Perform the ***Main Transformer Test.*** 3. Perform the ***Firing Board Test.*** 4. Perform the ***SCR Bridge Test.*** 5. The control board may be faulty. See the ***Control Board LED Chart.***

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The 115 VAC receptacle is not working. The machine's welding output is normal.	1. The circuit breaker may be tripped. Reset if necessary. 2. Make sure the 115 VAC plug and "load" is in good working condition.	1. The circuit breaker may be defective. Check associated wiring. See the Wiring Diagram. 2. Check for 115 VAC at terminals #31 and #32 on the terminal strip. If 115 VAC is present at the terminal strip, check the wiring between the terminal stirp, the circuit breaker and the 115 VAC receptacle. If 115 VAC is NOT present at the terminal strip, perform the ***Main Transformer Test.*** 3. The 115 VAC receptacle may be defective.
When not welding for a period of time, the machine shuts down.	1. This may be a normal condition. See the ***Idle Shut Down Timer.***	

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The output control potentiometer does not function when the output control switch (SW3) is in the "Local" position. The DC-655 operates normally when controlled remotely.	1. The output control switch (SW3) may be defective.	1. The output control potentiometer or associated wiring may be faulty. See the Wiring Diagram.
The remote output control unit does not function properly when the output control switch (SW3) is in the "Remote" position. The DC-655 operates normally when controlled locally from the machine's output control potentiometer.	1. The remote control unit or connecting cable may be defective. Check or replace.	1. The output control switch (SW3) may be defective. Check or replace. See the Wiring Diagram. 2. Check the remote control leads #75, #76 and #77 at plug P15, the terminal strip and the 14-pin MS type connector. Check for loose or faulty connections. See the Wiring Diagram.

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The Thermal Protection Light is on but the fan does not run.	1. Check for obstructions that could prevent the fan from turning.	1. The fan motor could be faulty. Check or replace. 2. The Thermal Fan/Snubber PC Board may be defective. See the ***Thermal Fan/Snubber PC Board LED Chart.***
The fan runs continuously.	1. Note: The fan is thermal controlled. Under normal conditions, it does not continuously run.	1. The Thermal Fan Thermistor may be faulty. See the Wiring Diagram. 2. The Thermal Fan/Snubber PC Board may be defective. See the ***Thermal Fan/Snubber PC Board LED Chart.***
One or both of the optional digital meters are not lit.	1. Check for loose plugs P13 and P12 at the digital meter PC board.	1. The digital meter board may not be receiving voltages from the T1 transformer windings. Perform the ***Main Transformer Test.*** 2. Check the wiring between Plug J13 and the associated leads at the main transformer. See the Wiring Diagram. 3. The digital meter PC board may be faulty.

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The optional digital meter is not working properly and/or the display is erratic.	1. Make certain plugs P12 and P13 are securely plugged into the digital meter PC board. Also make sure plug P3 is securely plugged into the control board.	1. Check feedback leads #222, #210, #201 and #202 for loose or faulty connections. See the Wiring Diagram. 2. The optional digital meter PC board may be faulty.
The analog meters are not reading correctly.	1. Make sure plug P3 is securely plugged into the control board and plug J14 is securely seated in the plug assembly from the control board.	1. Check feedback leads #222, #210, #201 and #202 for loose or faulty connections. See the Wiring Diagram. 2. The meter(s) may be defective.

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
Poor arc characteristics in all processes.	1. Check the three-phase input line voltage at the machine. The input voltage must match the rating plate and reconnect panel. 2. Check the welding cables for loose or faulty connections. 3. Make sure the proper welding procedures are being used. (Wire feed speed, arc voltage and wire size) 4. Make sure the negative welding cable is connected to the correct negative output terminal. (Low or High inductance)	1. Check the weld mode switch (SW2) and associated leads for proper operation or loose or faulty connections. See the Wiring Diagram. 2. Perform the ***Firing Board Test.*** 3. Perform the ***SCR Bridge Test.*** 4. Perform the ***Main Transformer Test.*** 5. The control board may be faulty. See the ***Control Board LED Chart.***
Poor arc striking with semiautomatic or automatic wire feeders.	1. Make sure the proper welding procedures are being used. (Wire feed speed, arc voltage and wire size) 2. Check the welding cables for loose or faulty connections.	1. Perform the ***Firing Board Test.*** 2. Perform the ***SCR Bridge Test.*** 3. The control board may be faulty. See the ***Control Board LED Chart.***

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
WELDING PROBLEMS		
The arc is variable or sluggish.	1. Check the three-phase input line voltage at the machine. The input voltage must match the rating plate and reconnect panel configuration. 2. Make sure the machine's settings are correct for the welding process. 3. Check the welding cables for loose or faulty connections. Also make sure cables are sized correctly for the welding current. 4. See ***CV Mode Current Limiting.***	1. Check the weld mode switch (SW2) and associated leads for proper operation or loose or faulty connections. See the Wiring Diagram. 2. Perform the ***Firing Board Test.*** 3. Perform the ***SCR Bridge Test.*** 4. Perform the ***Main Transformer Test.*** 5. The control board may be faulty. See the ***Control Board LED Chart.***
The Arc Force Control (R4) has no effect on the arc.	1. The Arc Force Control is active only in the CC Stick mode. 2. The effect of the Arc Force Control will be less noticeable at high welding currents. Weld at low currents (less than 150 amps) and check the Arc Force control function.	1. Check the Arc Force Control potentiometer (R4) for the correct resistance and proper operation. Normal resistance is 10,000 ohms. 2. Check the continuity of leads #321, #322 and #328 from the Arc Force Control to the control board. See the Wiring Diagram. 3. The control board may be faulty. Replace.

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

INTERNAL TRIGGER CIRCUIT TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will help determine if the wiring and connections are good from the 14-pin receptacle and terminal strip through the P15 and P16 connectors and thermostats to the firing board. The technician will also be able to determine if the 42 VAC trigger supply voltage is present.

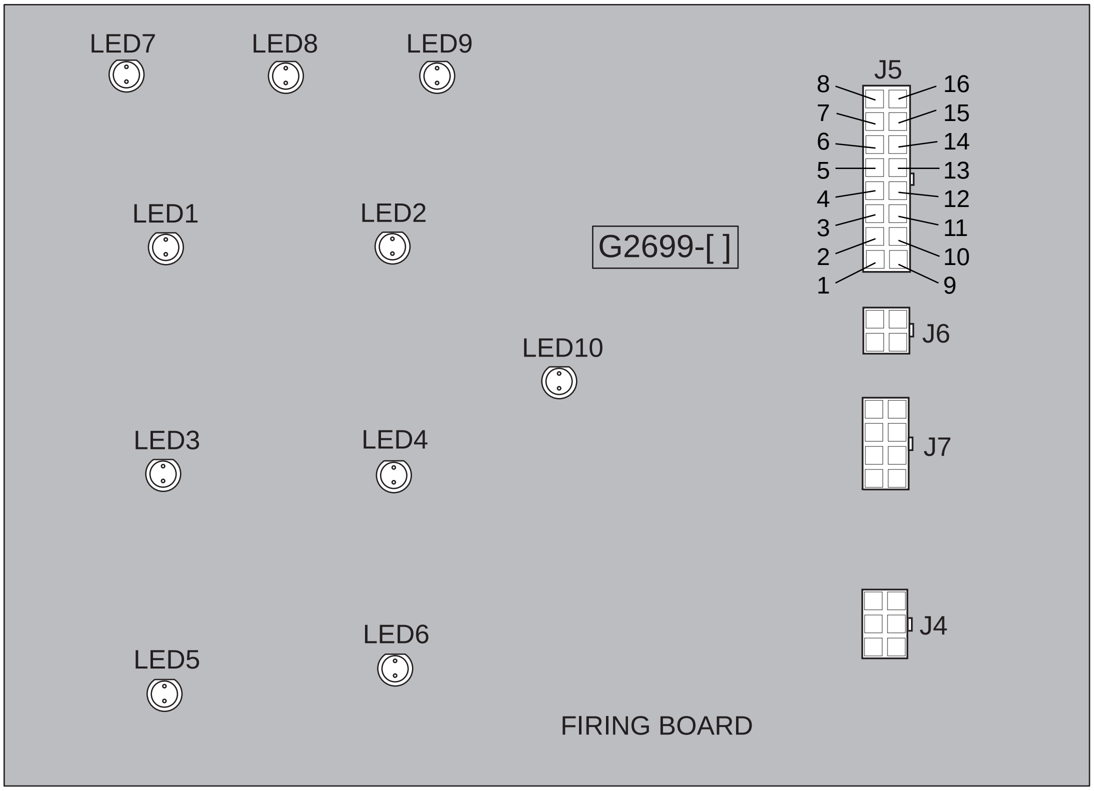
MATERIALS NEEDED

Ohmmeter (Multimeter)
DC-655 Wiring Diagram
Simplified Trigger Diagram

Return to Section TOC
Return to Master TOC

INTERNAL TRIGGER CIRCUIT TEST *(continued)*

FIGURE F.1 – FIRING BOARD TRIGGER CIRCUIT TEST POINTS AND LEDS



⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch electrically hot parts.

TEST PROCEDURE

1. With the correct input power applied to the DC-655 and the trigger circuit activated, LED 10 on the firing board should be lit. See Figure F.1. If LED 10 lights when the trigger is activated, the wiring and circuitry to the firing board is good. Perform the ***Firing Board Test*** and see the ***Control Board LED Chart.*** See the ***Simplified Trigger Diagram.***

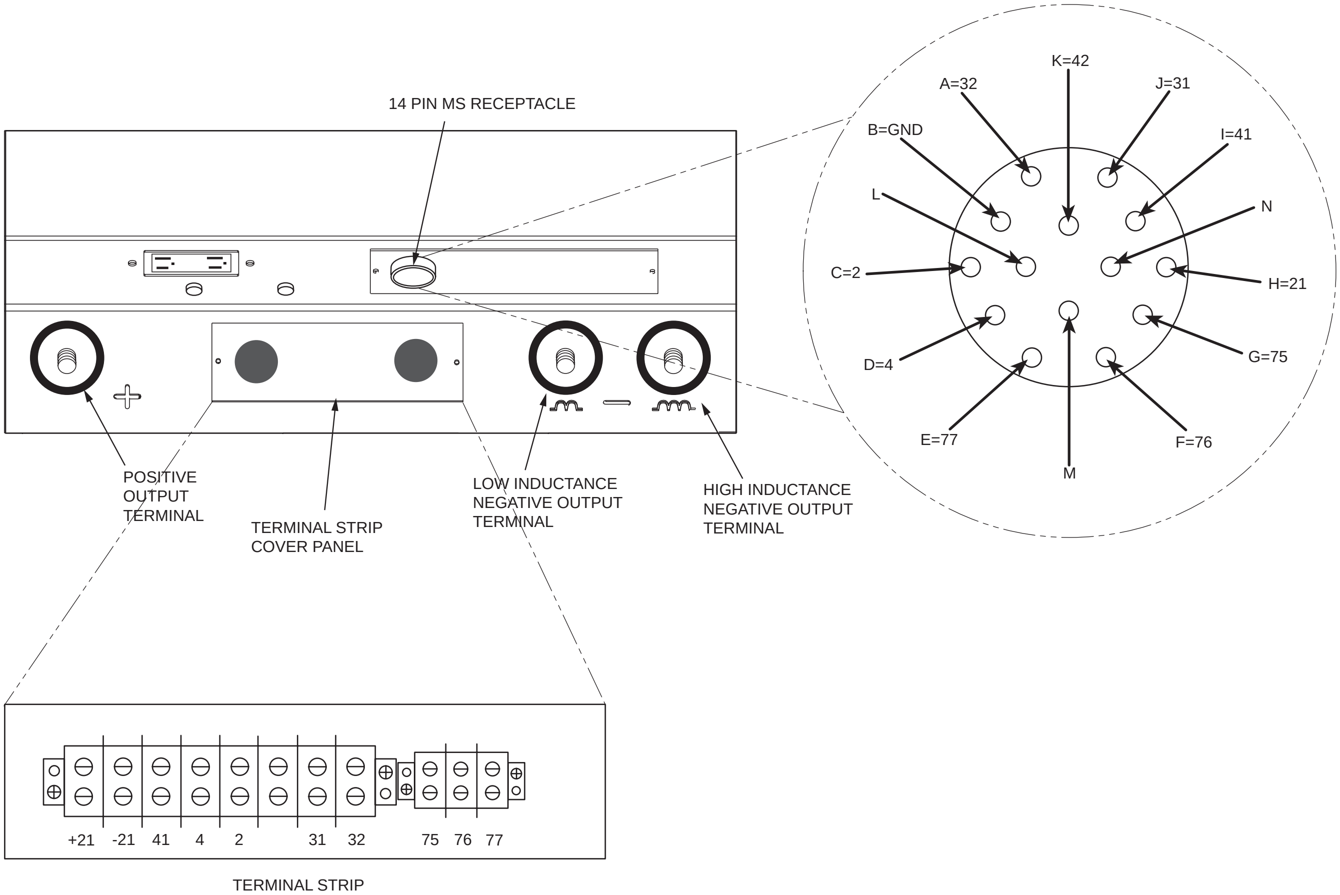
NOTE: LED 10 should not be lit if the trigger circuit is not activated.

2. If LED 10 does not light when the trigger circuit is activated, proceed with the following voltage and continuity checks.

3. Check the 10 Amp circuit breaker. It is the one closest to the 115V duplex receptacle. Reset if tripped.

Return to Section TOC
Return to Master TOC

FIGURE F.2 – TERMINAL STRIP AND 14-PIN RECEPTACLE



4. Check for the presence of 42 VAC at the terminal strip (#2 to #41). See the ***Simplified Trigger Diagram.***

5. If 42 VAC is not present at the terminal strip, check the circuit breaker and leads #42A and #41 at the P15 connector. See the ***Simplified Trigger Diagram.*** Also perform the ***Main Transformer Test.***

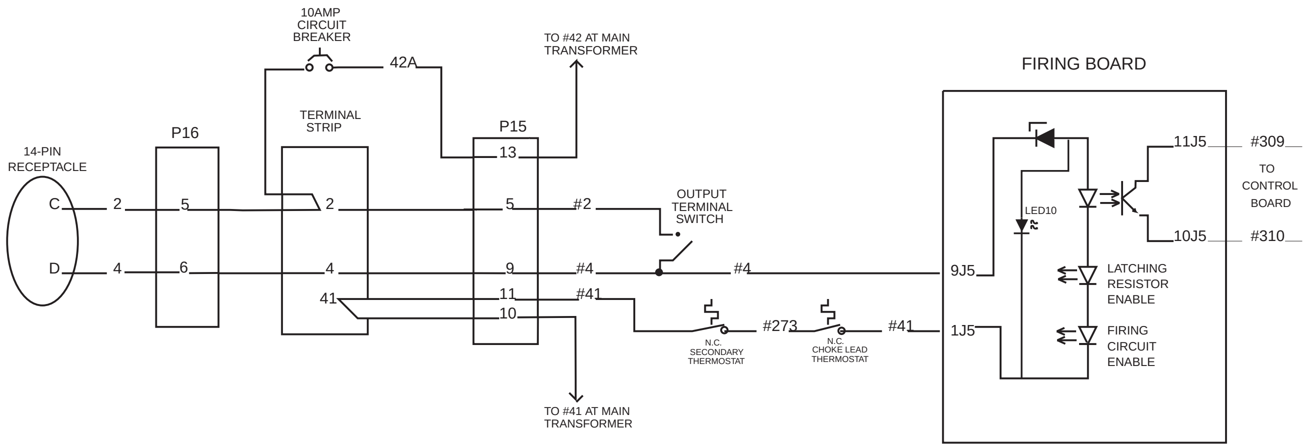
6. Remove the main input supply power to the DC-655 machine.

7. Check continuity (zero ohms) from lead #42A (plug P15 pin-13) to lead #2 at the 14-pin receptacle pin "C". Also check continuity to the output terminal switch. See the ***Simplified Trigger Diagram.*** If a resistance of any value is indicated, check the associated wires and plugs.

8. Check continuity (zero ohms) from pin "D" (lead #4) at the 14-pin receptacle to the output terminal switch and also to plug J5-pin 9 at the firing board. See the ***Simplified Trigger Diagram*** and Figures ***F.1*** and F.2. If a resistance of any value is indicated, check the associated wires and plugs.

9. Check continuity (zero ohms) from lead #41 (plug P15 pin-10) to plug J5-pin 1 at the firing board. See the ***Simplified Trigger Diagram*** and ***Figure F.1.*** If a resistance of any value is indicated, check the associated wires, plugs and thermostats.

FIGURE F.3 – SIMPLIFIED TRIGGER DIAGRAM



Return to Section TOC
Return to Master TOC

FIRING BOARD TEST

WARNING

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If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will help determine whether or not the firing board is receiving the correct voltages and signals. The LEDs (Light Emitting Diodes) will help determine if the firing board is generating gate signals for the main SCRs.

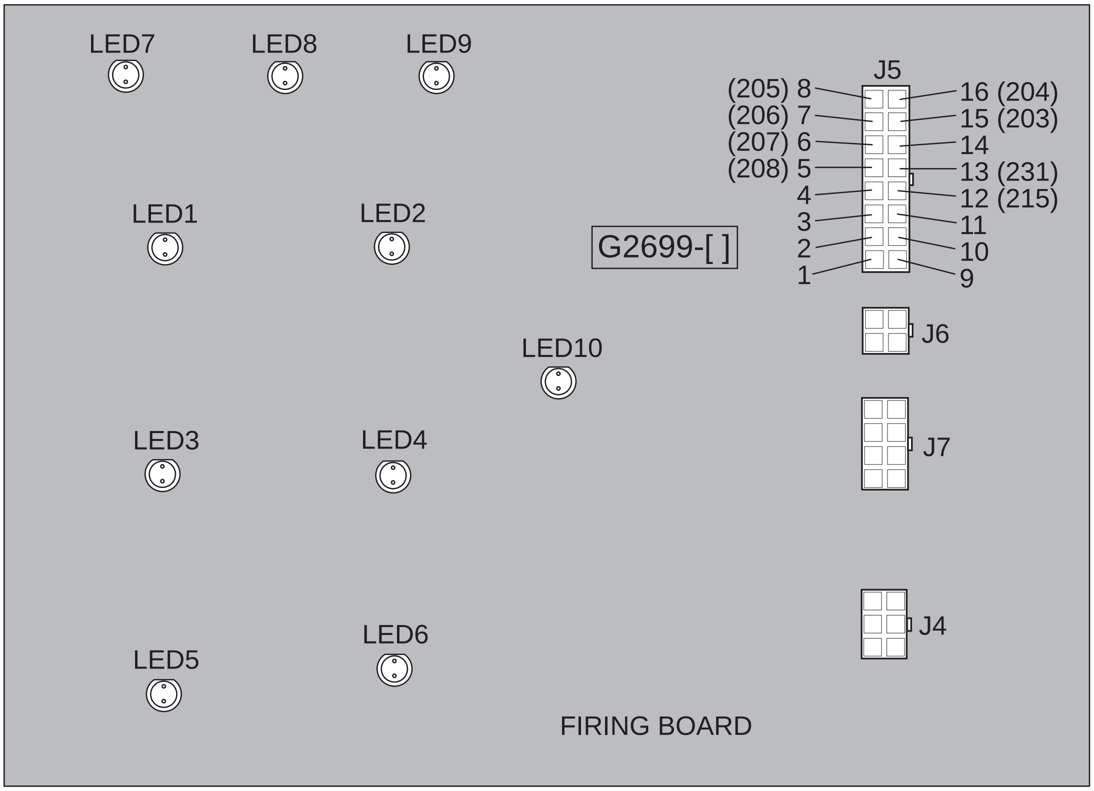
MATERIALS NEEDED

Volt/ohmmeter (Multimeter)
DC-655 wiring diagram and firing board schematic drawing

Return to Section TOC
Return to Master TOC

FIRING BOARD TEST *(continued)*

FIGURE F.4 – FIRING BOARD TRIGGER CIRCUIT TEST POINTS AND LEDs



TEST PROCEDURE

1. Disconnect the AC input power to the DC-655 machine.
2. Locate the firing board on the left side of the control box.
3. Perform a visual inspection on the firing board to see if there are any loose or faulty connections or physical damage.
4. Connect the correct AC input power to the DC-655.

WARNING

ELECTRIC SHOCK can kill.

- Do not touch electrically hot parts.

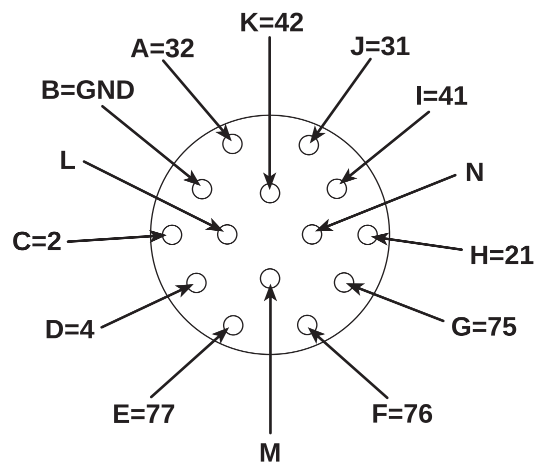
5. Turn the power switch (SW1) to the ON position.
6. LEDs 7, 8 and 9 should be lit and equally bright. See Figure F.4 to locate the LEDs. Use Table F.1 to check operation of LEDs 7, 8, and 9. The three LEDs should be of equal intensity.

FIRING BOARD TEST *(continued)*

TABLE F.1 - LED 7, 8, 9 AND 10

IF	THEN
LED 7 is ON	32 VAC power is being supplied to the firing board from leads #203 and #204 connected to the phase angle winding in the Main Transformer. Normal is 32 VAC.
LED 7 is not lit or is dimmer than the other LEDs	The proper AC voltage may not be reaching the firing board. Check for loose or faulty connections. Perform the ***Main Transformer Test.***
LED 8 is ON	32 VAC power is being supplied to the firing board from leads #205 and #206 connected to the phase angle winding in the Main Transformer.
LED 8 is not lit or is dimmer than the other LEDs	The proper AC power may not be reaching the firing board. Check for loose or faulty connections. Perform the ***Main Transformer Test.***
LED 9 is ON	32 VAC power is being supplied to the firing board from leads #207 and #208 connected to the phase angle winding in the ***Main Transformer.***
LED 9 is not lit or is dimmer than the other LEDs	The proper AC power may not be reaching the firing board. Check for loose or faulty connections. Perform the ***Main Transformer Test.***
LED 10 is ON	This indicates the trigger circuit is activated at the 14-pin receptacle or the terminal strip or that the Output Terminal Switch (SW5) is closed.

FIGURE F.5 – 14-PIN RECEPTACLE



7. Connect a jumper wire from pin C (lead #2) to pin D (lead #4) at the 14-pin receptacle. See Figure F.5. (Or put the Output Terminal Switch in the ON position.) This should initiate machine output at the welding terminals. LED 10 on the firing board should now be on. See ***Table F.1.*** If LED 10 does not glow when leads #2 and #4 are connected together, perform the ***Internal Trigger Test.*** The firing board may be faulty.

8. Locate LEDs 1 to 6 on the firing board. See ***Figure F.4.*** Each LED should glow with equal brightness.

   NOTE: LEDs 1 through 6 indicate that the SCR gate firing signals are being generated by the firing board.

9. Set the Output Control Switch (SW3) in the "Output Control at DC-655" (local) position.

10. Set the Mode Switch (SW2) in a constant voltage (CV) position.

11. Rotate the Output Control Potentiometer (R1). As the pot is turned clockwise, LEDs 1 through 6 should get brighter. As the pot is turned counter-clockwise, the LEDs should get dimmer.

    If the LEDs glow and change in brightness equally as the pot is turned, and the problem continues, the SCR bridge may be faulty. Perform the ***SCR Output Bridge Test.***

    If one or two lights stay bright or dim and the others change, this could indicate an open or shorted gate lead or faulty snubber board. Perform the ***SCR Output Bridge Test.*** If the Output Bridge and associated gate leads are OK, the firing board may be faulty.

    If all of LEDs 1 through 6 do not glow or do not change in brightness equally as the output control is rotated, go to step 12.

Return to Section TOC
Return to Master TOC

12. Test for 9.5 VDC to 11.0 VDC between leads #231 and #215 on the firing board.

    Make sure the Mode Switch (SW2) is in a constant voltage (CV) position.

    Locate plug J5 on the firing board. Locate leads #231 (pin-13) and #215 (pin-12). See ***Figure F.4.***

    Connect a jumper wire from pin C (lead #2) to pin D (lead #4) at the 14-pin receptacle. (Or put the Output Terminal Switch in the ON position.) This should initiate machine output at the welding terminals.

    Rotate the Output Control (R1) clockwise and counter-clockwise. The DC voltage between leads #231 and #215 should vary from 9.5 VDC to 11.0 VDC as the control is turned from minimum to maximum. If the voltage varies and LEDs 1 through 6 do NOT vary in brightness, the firing board may be faulty.

    If the voltage does NOT vary, the control board, control potentiometer or associated leads may be faulty. See the Wiring Diagram.

13. Test for approximately 5.5 VDC between leads #231 and #215 on the firing board. See ***Figure F.4.***

    Put the Mode Switch (SW2) in the constant current (CC) position.

    Rotate the Output Control (R1) clockwise and counter-clockwise. The DC voltage between leads #231 and #215 should be constant at approximately 5.5 VDC. This voltage should not vary when the output control is turned.

MAIN TRANSFORMER (T1) VOLTAGE TEST

WARNING

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If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

TEST DESCRIPTION

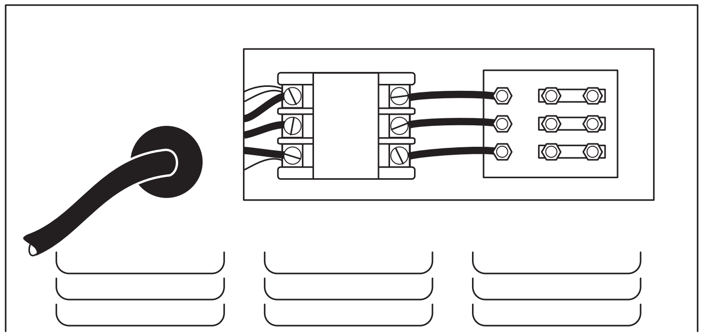
This test will determine if the correct voltages are being applied to the primary windings of the main transformer. The secondary windings, the auxiliary windings and the phase angle windings will also be checked.

MATERIALS NEEDED

Volt/ohmmeter (Multimeter)
DC-655 Wiring Diagram

MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

FIGURE F.6 – INPUT CONTACTOR AND PRIMARY LEADS



TEST PROCEDURE

1. Disconnect the main input power from the DC-655.
2. Inspect the input contactor, reconnect panel and primary leads to the main transformer for loose or faulty connections. See Figure F.6. Remove the case sides.
3. Confirm that the reconnect panel is configured correctly for the three-phase AC input power supplied to the DC-655. See the connection diagram located on the inside of the input box assembly.
4. Connect the correct AC three-phase input power to the DC-655 machine.

⚠ WARNING

ELECTRIC SHOCK can kill.



- Do not touch electrically hot parts.

5. Turn the power switch (SW1) to the ON position.
6. Make sure the input contactor (CR1) energizes.
7. Test with an AC voltmeter for the proper main AC input voltages applied to the line side of the input contactor (CR1). See the Wiring Diagram. If the correct voltages are not present at the line side of the input contactor, check the input fuses and leads.

   a. L1 to L2

   b. L2 to L3

   c. L1 to L3
8. Test with an AC voltmeter for the proper AC input voltages at the output side of the input contactor (CR1). See the Wiring Diagram. If the correct voltages are not present, perform the ***Input Contactor Test.***

   a. T1 to T2

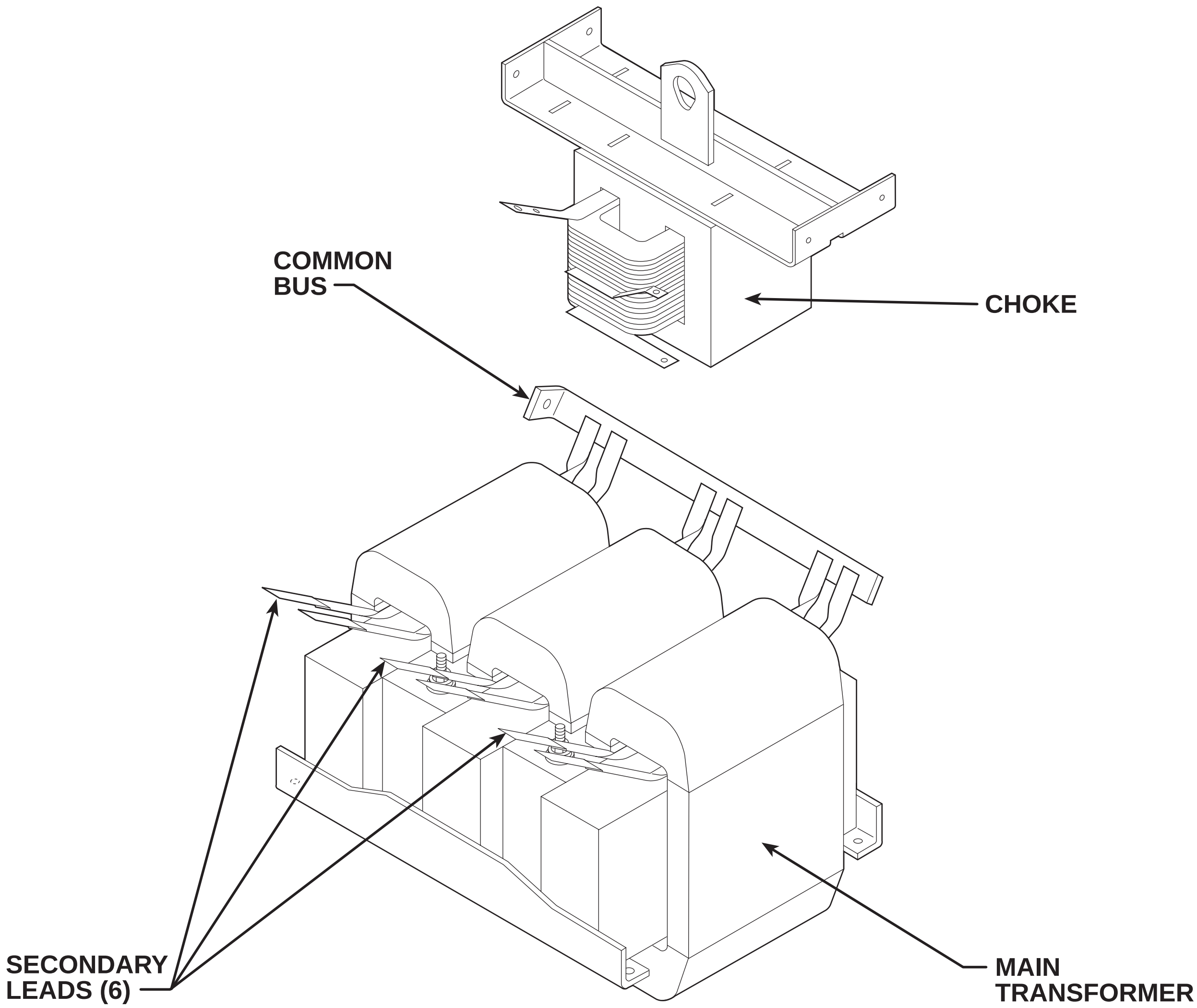
   b. T2 to T3

   c. T1 to T3

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Return to Master TOC
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Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

FIGURE F.7 - MAIN TRANSFORMER SECONDARY LEADS TO COMMON BUS VOLTAGE CHECK



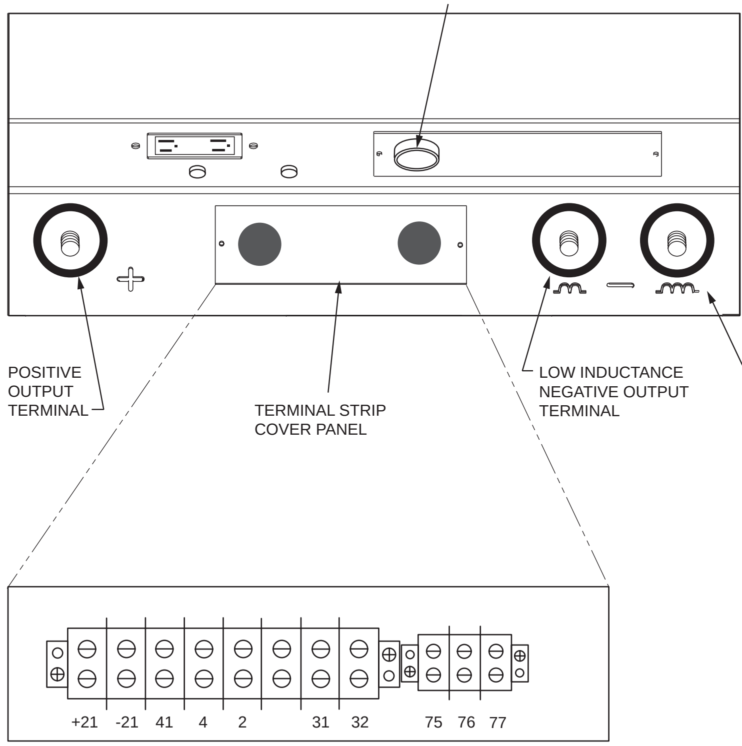
9. Test with an AC voltmeter for approximately 55 VAC from each of the six main transformer secondary leads to the common bus connected to the output choke. See Figure F.7.

NOTE: The secondary voltages will vary if the input line voltages vary. If any one or more of the voltage checks are incorrect, check for loose or faulty connections. See the Wiring Diagram. If the leads and connections are OK, the main transformer may be faulty.

Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

FIGURE F.8 - TERMINAL STRIP

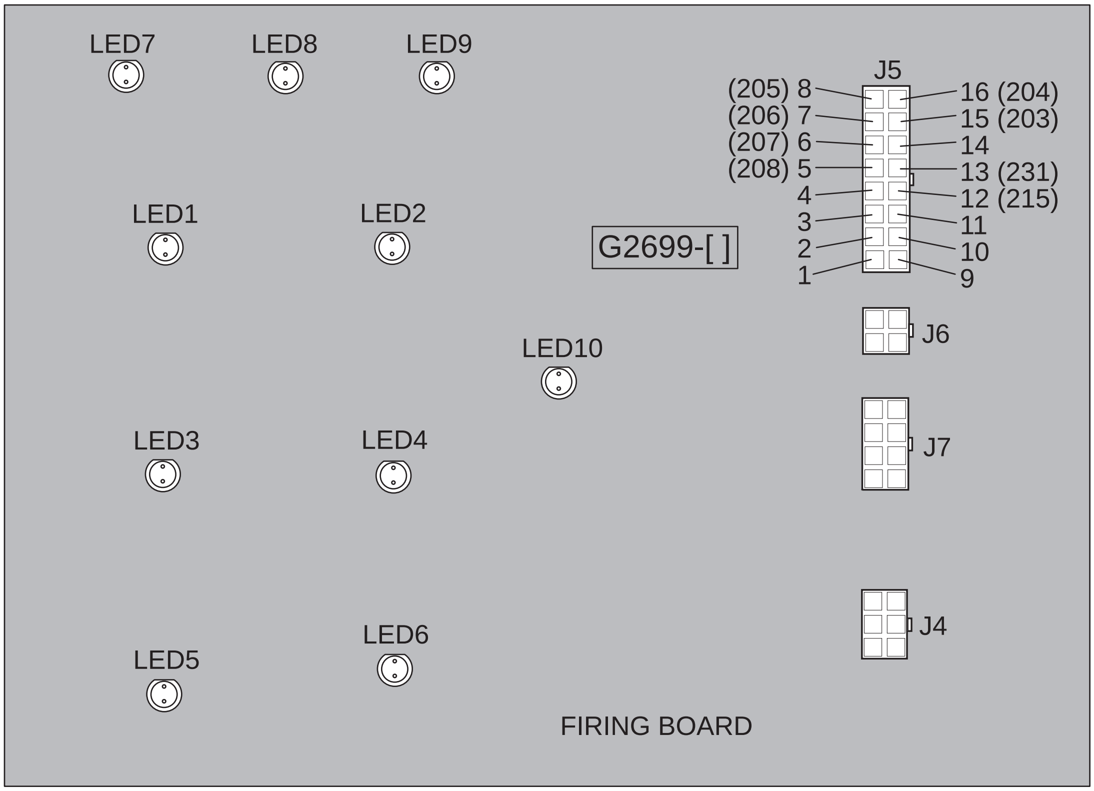


10. Test for 115 VAC between leads #31 and #32 on the terminal strip. The terminal strip can be accessed by removing the small panel at the lower portion of the case front. See Figure F.8. 115 VAC AC should also be present at the 115 VAC receptacle. If the correct voltage is not present, make sure the 20 amp circuit breaker is not tripped or faulty. Also check the wiring between the main transformer, the terminal strip, the circuit breaker and the receptacle. See the Wiring Diagram.
11. If 115 VAC is NOT present and the wiring and circuit breaker are good, the main transformer may be defective.
12. Test for 42 VAC between leads #41 and #2 on the terminal strip. The terminal strip can be accessed by removing the small panel at the lower portion of the case front. See Figure F.8. If the correct voltage is not present, make sure the 10 amp circuit breaker is not tripped or faulty. Also check the wiring between the main transformer, the terminal strip, and the circuit breaker. See the Wiring Diagram.
13. Remove the AC input power to the DC-655. Remove the screws from the control box cover and carefully lower the cover.
14. Locate the firing board on the left side of the control box.

Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER (T1) VOLTAGE TEST *(continued)*

FIGURE F.9 - FIRING BOARD PLUG J5 PINS



15. Locate plug J5 on the firing board. See Figure F.9.

⚠ WARNING

ELECTRIC SHOCK can kill.



- Do not touch electrically hot parts.

16. Turn on the DC-655 and check for approximately 32 VAC at the following leads and pins at plug J5. These are the phase angle winding voltages. See Fig. F.9.

    Plug J5 pin-15 (lead #203) to pin-16 (lead #204)

    Plug J5 pin-8 (lead #205) to pin-7 (lead #206)

    Plug J5 pin-6 (lead #207) to pin-5 (lead #208)

17. Locate plug J13 on the optional digital meter board. If a digital meter board is not in place, plug J13 will not be used but will be present in the harness. Check the following voltages at the appropriate leads and pin locations.

    10 VAC Plug J13 pin-1 (lead #331) to pin-2 (lead #332)

    10 VAC Plug J13 pin-4 (lead #333) to pin-5 (lead #334)

    42 VAC Plug J13 pin-3 (lead #335) to pin-6 (lead #336)

18. If the correct primary voltages are applied to the main transformer and any of the secondary voltages are missing or not correct, the transformer may be faulty.

    NOTE: Always check the wiring between the transformer windings and the test points before replacing the transformer.

Return to Section TOC
Return to Master TOC

CONTROL TRANSFORMER (T2) TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

TEST DESCRIPTION

This procedure will determine if the correct voltage is being applied to the primary of the control transformer and also if the correct voltage is being induced upon the secondary winding.

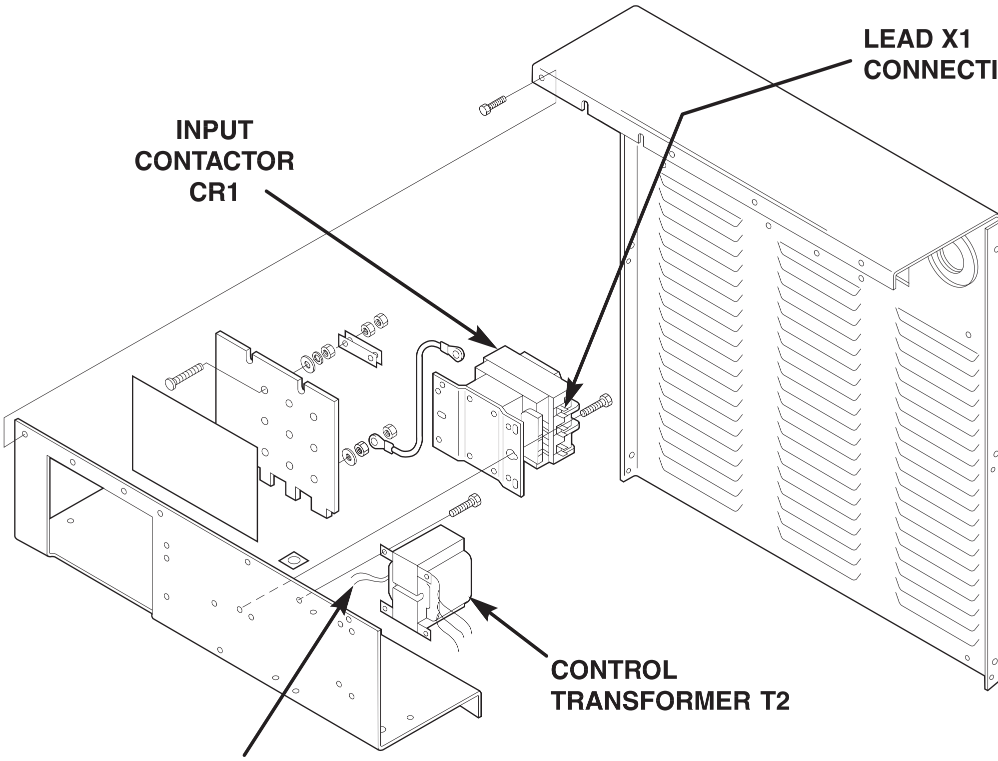
MATERIALS NEEDED

Volt/ohmmeter (Multimeter)
DC-655 Wiring Diagram

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

CONTROL TRANSFORMER (T2) TEST *(continued)*

FIGURE F.10 – CONTROL TRANSFORMER



TEST PROCEDURE

1. Disconnect the main AC input voltage to the DC-655.
2. Remove the case top and sides.
3. Locate the control transformer (T2) on the left side of the input box (facing the back of the machine). See Figure F.10.
4. Locate the control transformer primary leads (H1, H2, H3, etc.). See the Wiring Diagram.

NOTE: Unused leads should be insulated and taped. Inspect for broken or incorrect connections.

Return to Section TOC
Return to Master TOC

CONTROL TRANSFORMER (T2) TEST *(continued)*

5. Locate the control transformer secondary leads. See ***Figure F.10.*** Lead X1 is connected to the coil terminal on the CR1 input contactor. Lead X2 is spliced into lead #211, which is then connected to the input power switch (SW1).

⚠ WARNING



HIGH VOLTAGE is present at the input leads.

6. Apply the correct three-phase input power to the DC-655 and check for 115 VAC at leads X1 to X2.

   NOTE: The DC-655 does not have to be ON to perform this test. If the main AC input supply voltage varies, the control transformer secondary voltage will vary by the same percentage.

7. If approximately 115 VAC is present at leads X1 to X2, the control transformer is functioning properly.

8. If approximately 115 VAC is NOT present at leads X1 to X2, make certain the correct input voltage is being applied to the primary winding of the control transformer and that the correct primary leads (H1, H2, H3, etc.) are being used. See the connection information diagram on the input access door.

9. If the correct voltage is being applied to the primary of the control transformer and the secondary voltage is incorrect or not present, the control transformer may be defective.

CONTROL BOARD TRANSFORMER (T3) TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

TEST DESCRIPTION

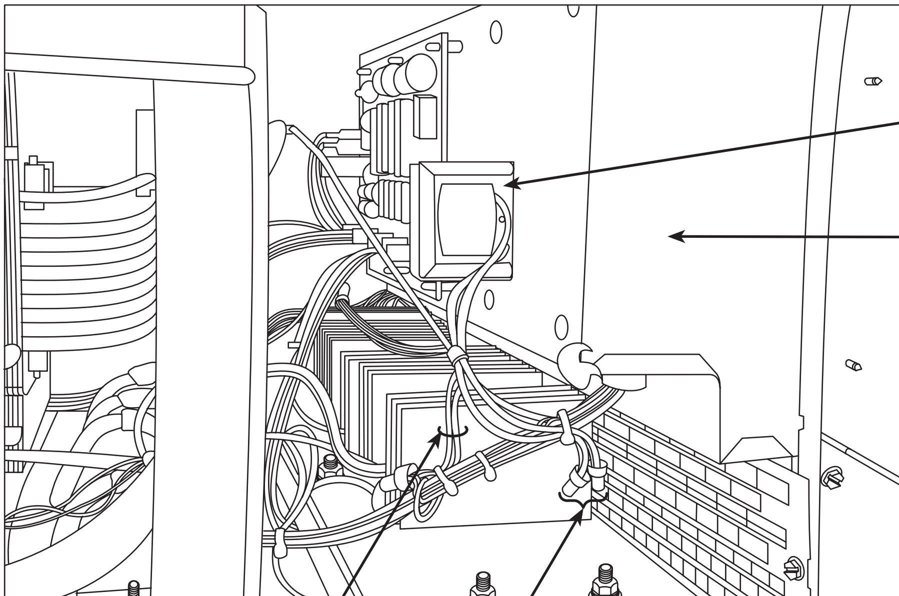
This test will determine if the correct voltage is being applied to the primary winding of the control board transformer (T3) and also if the correct voltage is being induced upon the secondary winding.

MATERIALS NEEDED

Volt/ohmmeter (Multimeter)
DC-655 Wiring Diagram

CONTROL BOARD TRANSFORMER (T3) TEST *(continued)*

FIGURE F.11 – CONTROL BOARD TRANSFORMER (T3) LEADS



TEST PROCEDURE

1. Disconnect the main AC input power to the DC-655 machine.
2. Remove the case top and sides.
3. Locate the control board transformer (T3) mounted on the rear of the control box. See Figure F.11.
4. Locate the transformer (T3) primary leads (#255 and $256). See Figure F.11 and the Wiring Diagram. Also locate the secondary leads (#281 and #282).

WARNING

ELECTRIC SHOCK can kill.

- Do not touch electrically hot parts.

5. Apply the correct three-phase input power to the DC-655 and turn the power switch (SW1) to the ON position.
6. Carefully check for 42 VAC at the secondary leads (#281 to #282). If 42 VAC is present, the control board transformer (T3) is good. If 42 VAC is missing or low, proceed to the next step.
7. Carefully check for 115 VAC at the primary leads (#255 and #256). If the 115 VAC is present but the secondary voltage (42 VAC) is missing or low, the T3 transformer may be faulty. Replace.
8. If the 115 VAC is NOT present at the primary leads, check the associated switch (SW1) and wiring. See the Wiring Diagram.
9. Perform the ***Control Transformer (T2) Test.***

INPUT CONTACTOR TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will help determine if the input contactor is receiving the correct coil voltage and if the contacts are functioning correctly.

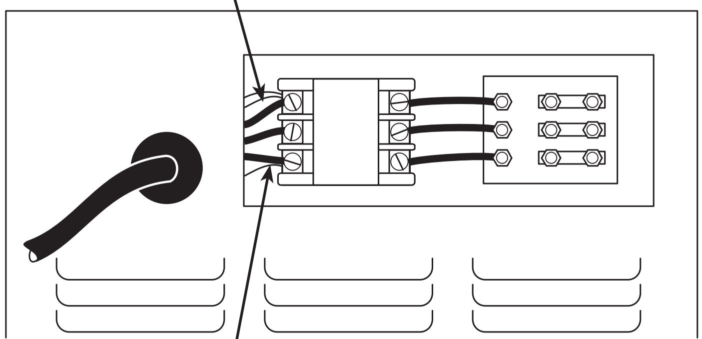
MATERIALS NEEDED

Volt/ohmmeter (Multimeter)
3/8" Nut driver
DC-655 Wiring Diagram
External 120 VAC supply

Return to Section TOC
Return to Master TOC

INPUT CONTACTOR TEST *(continued)*

FIGURE F.12 – INPUT CONTACTOR CONNECTIONS



TEST PROCEDURE

1. Disconnect the main input supply power to the machine.
2. With the 3/8" nut driver, remove the case top and input access cover.
3. Locate the three leads connected to the input contactor coil (X1/#256 and #255A). See Figure F.12.
4. Connect an AC voltmeter to the leads.

WARNING

ELECTRIC SHOCK can kill.

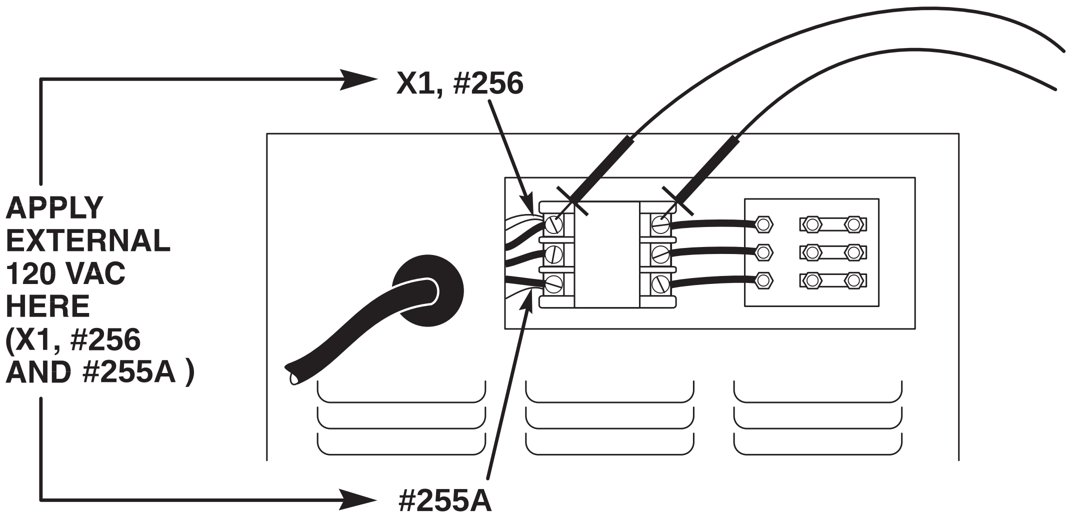


• Do not touch electrically hot parts.

5. Apply the correct three-phase input power to the DC-655 and turn the power switch (SW1) to the ON position.
6. Check for 120 VAC at the contactor coil leads.
7. If the 120 VAC is NOT present, with the input power switch (SW1) on, check the switch and associated circuitry. See the Wiring Diagram. Also see the ***Control Board LED Chart.*** Relay CR2 may be faulty. See the Wiring Diagram. Perform the ***Control Transformer (T2) Test.***
8. If the 120 VAC IS present and the contactor does NOT activate, the input contactor is faulty. Replace the input contactor.

INPUT CONTACTOR TEST *(continued)*

FIGURE F.13 – INPUT CONTACTOR TEST CONNECTIONS



TEST FOR CONTACT CONTINUITY

1. Disconnect the main input supply power to the DC-655 machine.
2. Locate, label and remove the three leads connected to the input contactor coil (X1/#256 and #255A). See Figure F.13.

⚠ WARNING



ELECTRIC SHOCK can kill.

- Do not touch electrically hot parts.

3. Using the external 120 VAC supply, apply 120 VAC to the terminals of the input contactor coil. If the contactor does NOT activate, the input contactor is faulty.
4. With the contactor activated, check the continuity across the contacts. (Zero ohms or very low resistance is normal.) See Figure F.13. If the resistance is high, the input contactor is faulty. Replace the input contactor.
5. When the contactor is NOT activated, the resistance should be infinite or very high across the contacts. If the resistance is low, the input contactor is faulty. Replace the input contactor.

Return to Section TOC
Return to Master TOC

STATIC SCR TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

TEST DESCRIPTION

The test is used to quickly determine if an SCR is shorted or "leaky." See the ***Oscilloscope Waveform*** Section in this manual for normal and abnormal SCR waveforms.

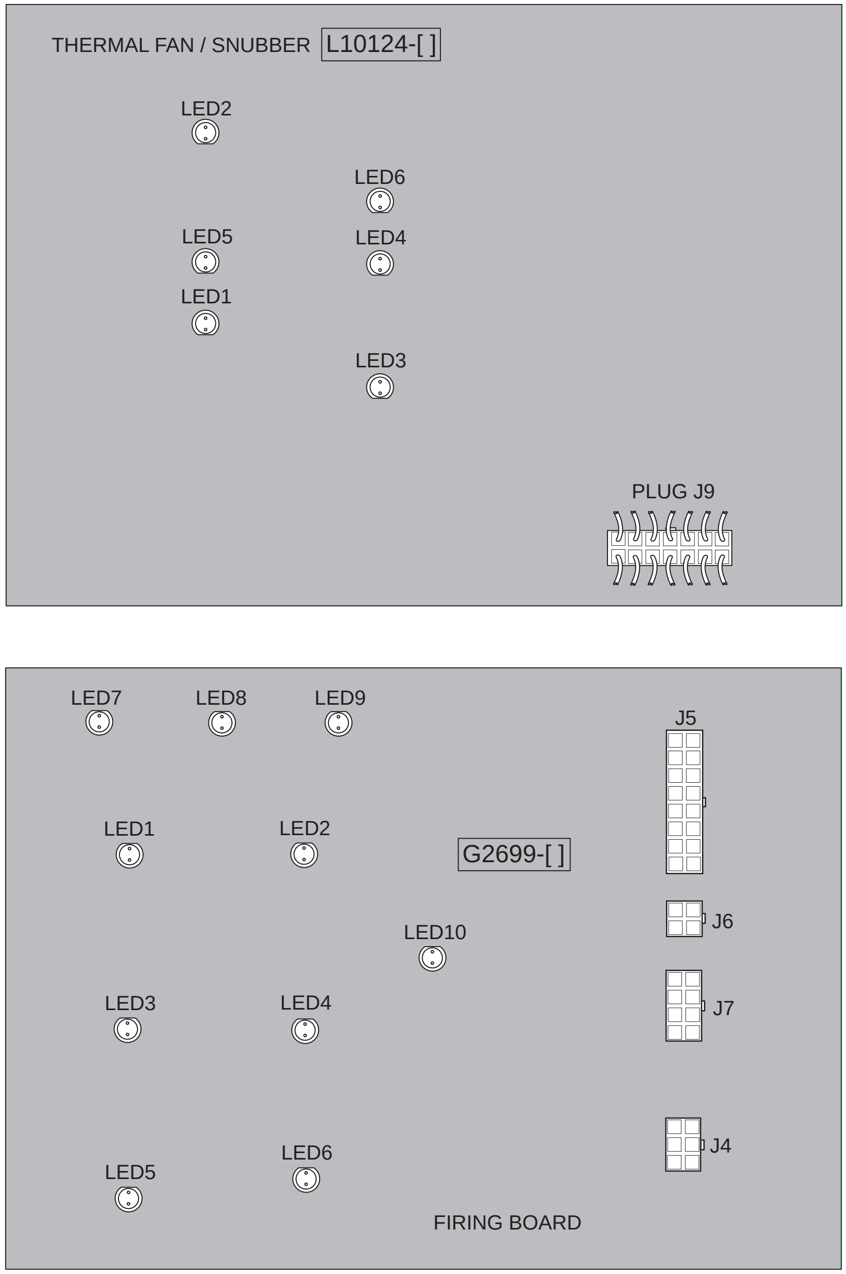
MATERIALS NEEDED

Analog ohmmeter (Multimeter)
DC-655 Wiring Diagram

Return to Section TOC Return to Master TOC
Return to Section TOC Return to Master TOC
Return to Section TOC Return to Master TOC
Return to Section TOC Return to Master TOC

STATIC SCR TEST *(continued)*

FIGURE F.14 – THERMAL FAN/SNUBBER BOARD AND FIRING BOARD PLUG LOCATIONS



TEST PROCEDURE

1. Disconnect the main AC input power to the DC-655 machine.

2. Locate and disconnect plug J9 from the thermal fan/snubber board and plug J5 from the firing board. See Figure F.14.

3. Remove the red insulating paint from the heat sink test points. See Figure F.15. DO NOT DISASSEMBLE THE HEAT SINKS.

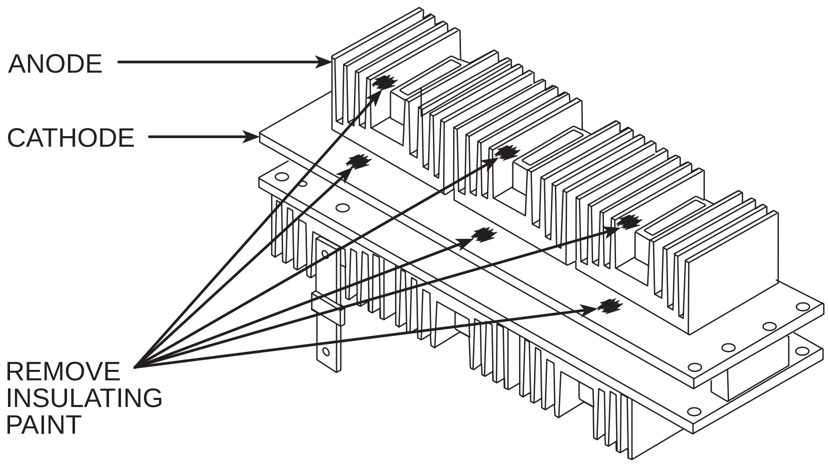
4. Test for high or infinite resistance from the anode to the cathode of SCR1. See ***Figure F.15.*** Use an analog ohmmeter (multimeter).

5. Test for high or infinite resistance from the cathode to the anode of SCR1 by reversing the meter leads. See ***Figure F.15.***

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

STATIC SCR TEST *(continued)*

FIGURE F.15 – HEAT SINK TEST POINTS



6. If a high or infinite resistance is indicated for both steps #4 and #5, SCR1 is not shorted.
7. If a low resistance is indicated in either steps #4 or #5, there is a shorted SCR in the output rectifier bridge. Repeat steps #4 and #5 for each of the six SCRs. It may be necessary to disconnect the transformer secondary leads from the rectifier assembly to isolate the defective SCR(s). See the Wiring Diagram.
8. Replace plug J9 into the thermal fan/snubber board and plug J5 into the firing board.

NOTE: To further check the SCRs' functions use an SCR tester and proceed to the ***Active SCR Test.***

Return to Section TOC
Return to Master TOC

ACTIVE SCR TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

TEST DESCRIPTION

The Active SCR Test will determine if the device is able to be gated ON and conduct current from anode to cathode.

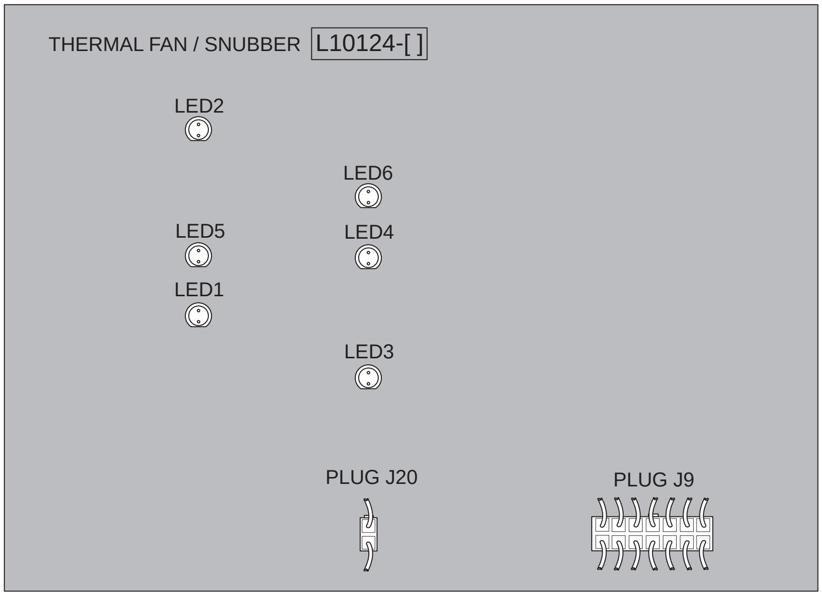
MATERIALS NEEDED

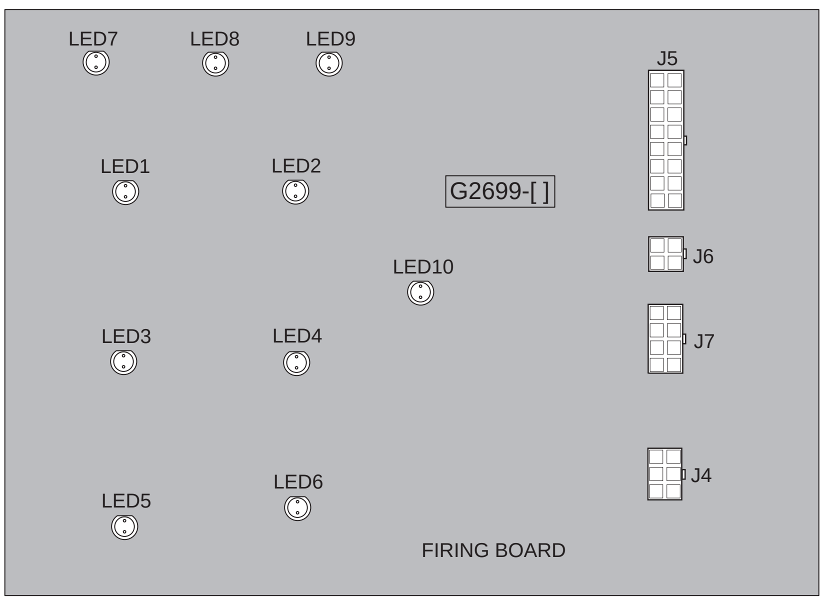
An SCR Tester as specified in this procedure
DC-655 Wiring Diagram

Return to Section TOC
Return to Master TOC

ACTIVE SCR TEST *(continued)*

FIGURE F.16 – THERMAL FAN/SNUBBER BOARD AND FIRING BOARD PLUG LOCATIONS





TEST PROCEDURE

1. Disconnect the main AC input power to the machine.

2. Locate and disconnect plug J9 from the thermal fan/snubber board and plug J5 from the firing board. See Figure F.16.

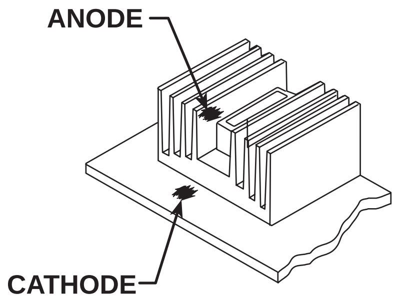
3. Remove the red insulating paint from the heat sink test points. See ***Figure F.17.*** DO NOT DISASSEMBLE THE HEAT SINKS.

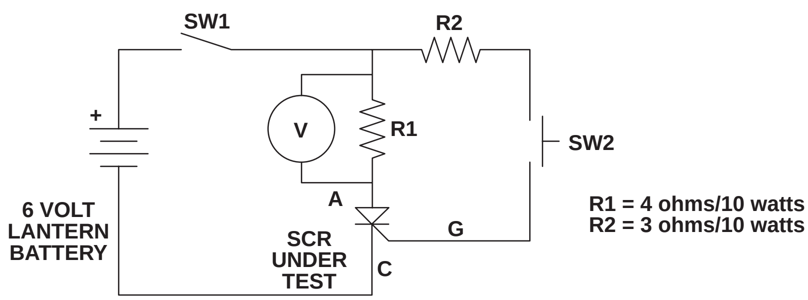
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Return to Section TOC
Return to Master TOC

ACTIVE SCR TEST *(continued)*

FIGURE F.17 – HEAT SINK TEST POINTS





To test SCRs construct the circuit outlined above. Resistor values are plus or minus ten precent. The voltmeter scale should be low, approximately 0-5 or 0-10 volts DC.

4. Construct the circuit shown in Figure F.17. One 6-volt lantern battery can be used. Set the voltmeter scale low, at approximately 0-5 volts or 0-10 volts.
   a. Test the voltage level of the battery. Short leads (A) and (C). Close switch SW-1. Battery voltage should be 4.5 volts or higher. If lower, replace the battery.

5. Connect the Tester to SCR 1 as shown in Figure F.17.
   a. Connect Tester lead (A) to the anode.
   b. Connect Tester lead (C) to the cathode.
   c. Connect Tester lead (G) to the gate.

6. Close switch SW-1.
   NOTE: Switch SW-2 should be open.

7. Read the meter for zero voltage.
   a. If the voltage reading is higher than zero, the SCR is shorted.

8. Close or keep closed switch SW-1.

9. Close switch SW-2 for 2 seconds and release and read the meter.
   a. If the voltage is 3-6 volts while the switch is closed and after the switch is open, the SCR is functioning.
   b. If the voltage is 3-6 volts only when the switch is closed or there is no voltage when the switch is closed, the SCR is defective.
   NOTE: Be sure the battery is functioning properly. A low battery can affect the results of the test. Repeat the battery test procedure in Step 4 if needed.

10. Open switch SW-1.

11. Reconnect the Tester leads. See Figure F.17.
    a. Connect Tester lead (A) to the cathode.
    b. Connect Tester lead (C) to the anode.
    c. Disconnect Test lead (G) from the gate.

12. Close switch SW-1.

13. Read the meter for zero voltage.
    a. If the voltage is zero, the SCR is functioning.
    b. If the voltage is higher than zero, the SCR is shorted.

14. Perform the Active Test Procedure outlined in Steps 5-13 for SCRs 2-6.

15. Replace all SCR assemblies that do not pass the above tests.

16. Plug J9 onto the thermal fan/snubber board and plug J5 into the firing board.

Return to Section TOC
Return to Master TOC

THERMAL FAN/SNUBBER BOARD LED CHART

LED #	LED FUNCTIONS AND INDICATIONS (Machine is ON)
1	Indicates fan should be running.
2	Indicates welding current is greater than 200 amps.
3	Indicates fan should be running due to heating of main SCRs.
4	Indicates an open thermal fan thermistor or an open connection between the thermistor and the thermal fan/snubber board. See the Wiring Diagram (leads #319 and #316).
5	Indicates a thermostat (choke or secondary) has opened. The thermal protection light should also be illuminated.
6	Indicates the fan motor should be running. LED 6 should be illuminated and the fan running when any of the following LEDs are lit: LED 2, LED 3, LED 4, or LED 5.

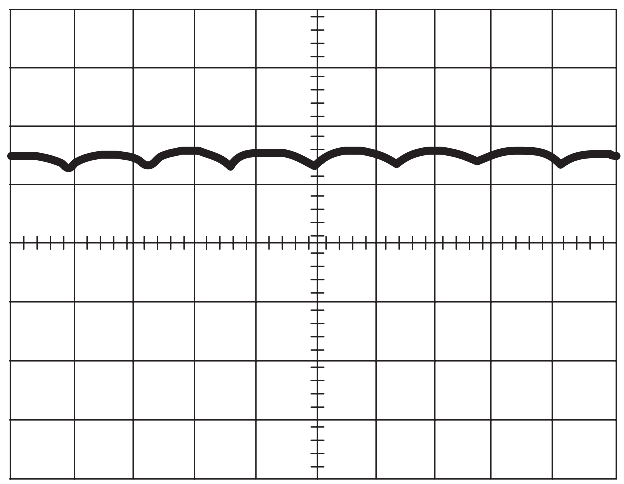
Return to Section TOC
Return to Master TOC

CONTROL BOARD LED CHART

LED #	LED FUNCTIONS AND INDICATIONS (Machine is ON)
1	Indicates that the mode switch (SW2) is in the CC mode. When LED 1 is on, LED 6 should also be illuminated.
2	Indicates that feedback voltage is present. This information is used when the machine is in a CV mode. This LED should get brighter as the output voltage is increased.
3	Indicates an input shutdown. The normally closed relay CR2 will activate causing input contactor CR1 to open. See ***Remote Control Leads Fault Protection Shutdown, Shorted Rectifier Fault Protection*** and ***Idle Shutdown Timer*** in the Operation Section.
4	Indicates an over current shutdown. See ***Over Current Protection Shutdown*** in the Operation Section.
5	Indicates output current is present.
6	Indicates that the machine is in the CC mode. LED 6 should be on whenever LED 1 is lit.
7	Indicates that the +16 VDC power supply is functioning. This circuitry is located on the control board.
8	Indicates the control signal is being generated to control the firing of the output SCRs. This signal is sent to the firing board. This LED should get **dimmer** as the output voltage is increased. This LED will normally be off when the machine is in the constant current mode at open circuit.
9	Indicates that the -10 VDC power supply is functioning. This circuitry is located on the control board.
10	Indicates that 42 VAC is being supplied to the control board from the control board T3 transformer.
11	Indicates that feedback voltage is present. This information is used when the machine is in the CC mode. This LED should get brighter as the output voltage is increased.

Return to Section TOC
Return to Master TOC

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM CONSTANT CURRENT MODE – NO LOAD



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 50 volts and that each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative high inductance terminal.

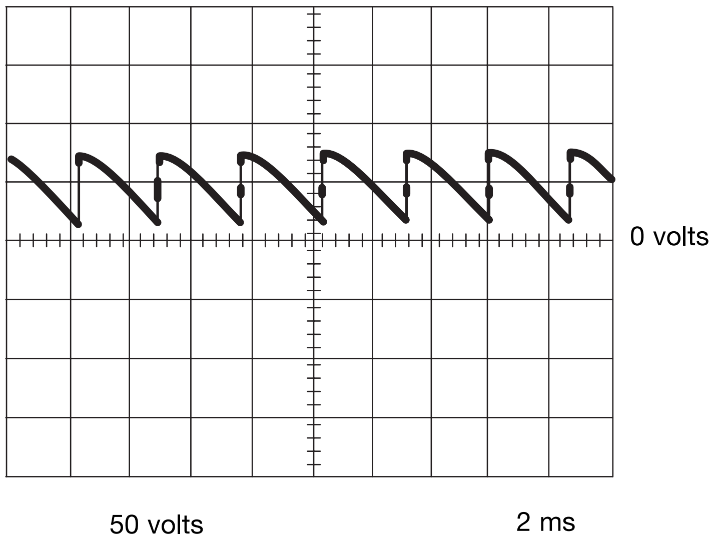
SCOPE SETTINGS

Volts/Div	50V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM CONSTANT VOLTAGE MIG

MAXIMUM OUTPUT SETTING – NO LOAD



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 50 volts and that each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative high inductance terminal.

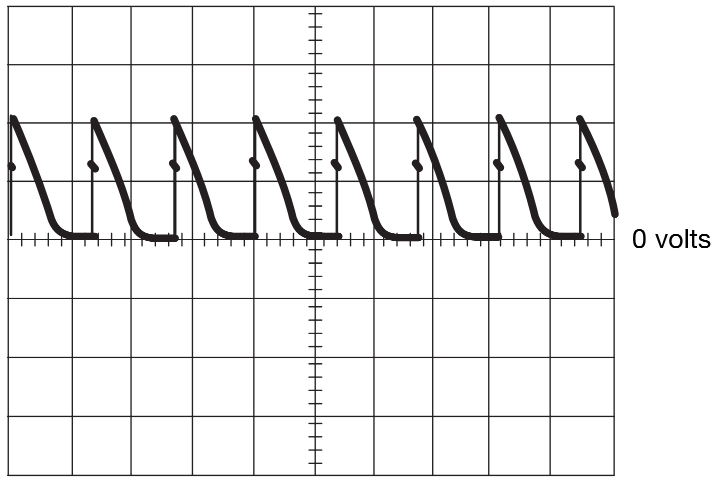
SCOPE SETTINGS

Volts/Div	50V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

NORMAL OPEN CIRCUIT VOLTAGE WAVEFORM CONSTANT VOLTAGE MIG

MINIMUM OUTPUT SETTING – NO LOAD



This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 2 milliseconds in time.

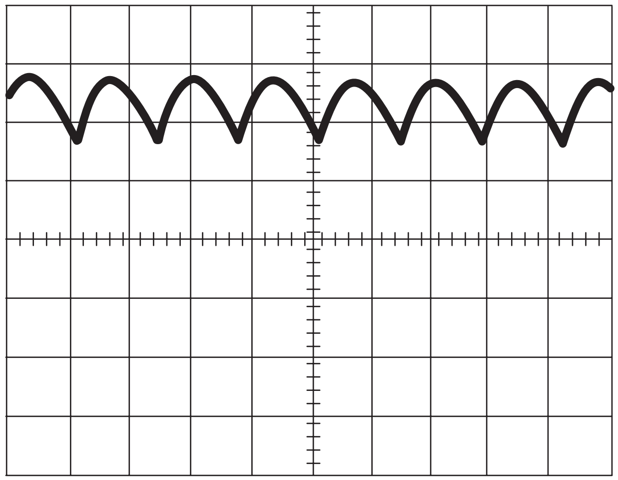
Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative high inductance terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
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Return to Section TOC
Return to Master TOC

TYPICAL OUTPUT VOLTAGE WAVEFORM - MACHINE LOADED CONSTANT VOLTAGE MIG MODE



0 volts

20 volts 2 ms

This is the typical DC open circuit voltage waveform generated from a properly operating machine. Note that each vertical division represents 20 volts and that each horizontal division represents 2 milliseconds in time. The machine was loaded with a resistance grid bank. The grid bank meters read 650 amps at 44 VDC.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative high inductance terminal.

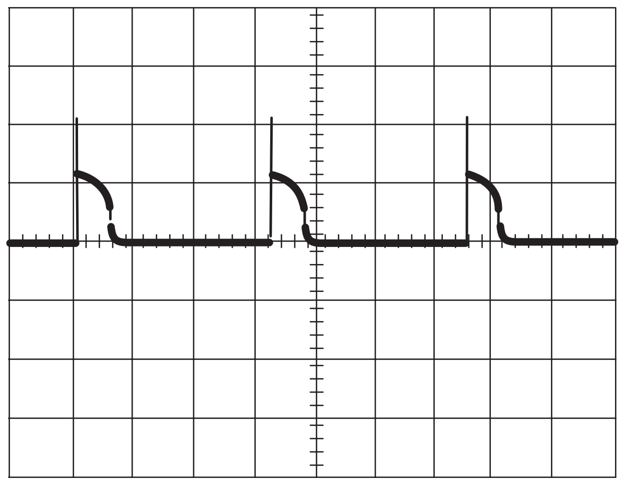
SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC

TYPICAL SCR GATE VOLTAGE WAVEFORM CONSTANT VOLTAGE MIG

MAXIMUM OUTPUT SETTING – NO LOAD



This is the typical DC open circuit voltage waveform. The machine was in an open circuit condition (no load) and operating properly. Note that each vertical division represents 2 volts and that each horizontal division represents 5 milliseconds in time.

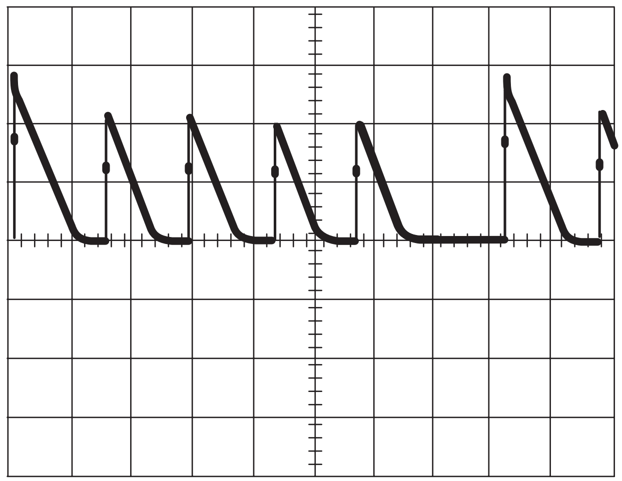
Note: Scope probes connected at SCR gate and cathode: (+) probe to gate, (-) probe to cathode.

SCOPE SETTINGS

Volts/Div	2V/Div.
Horizontal Sweep	5 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

ABNORMAL OPEN CIRCUIT VOLTAGE WAVEFORM CONSTANT VOLTAGE MIG ONE OUTPUT SCR NOT FUNCTIONING



This is NOT the typical DC open circuit voltage waveform. One output SCR is not functioning. Note the "gap" in the waveform. One SCR gate is disconnected to simulate an open or non-functioning output SCR. Each vertical division represents 20 volts and each horizontal division represents 2 milliseconds in time.

Note: Scope probes connected at machine output terminals: (+) probe to positive terminal, (-) probe to negative high inductance terminal.

SCOPE SETTINGS

Volts/Div	20V/Div.
Horizontal Sweep	2 ms/Div.
Coupling	DC
Trigger	Internal

Return to Section TOC
Return to Master TOC

INPUT CONTACTOR (CR1) CLEANING/REPLACEMENT

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

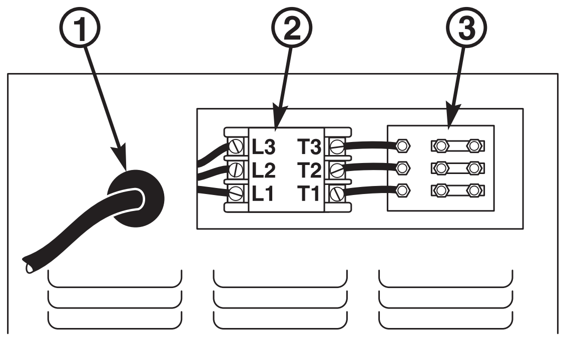
The following procedure will aid the technician in inspecting, cleaning, and replacing the input contactor.

MATERIALS NEEDED

Phillips head screw driver
5/16” Socket wrench
Flat head screw driver
Low pressure air source
Allen head type wrench

INPUT CONTACTOR (CR1) CLEANING/REPLACEMENT *(continued)*

FIGURE F.18 - INPUT CONTACTOR CLEANING AND REMOVAL



1. INPUT SUPPLY LINE
2. INPUT CONTACTOR CR1
3. RECONNECT PANEL

CLEANING PROCEDURE

1. Remove the main input supply power to the machine.
2. Locate and get access to the input contactor (CR1) in the input box. See Figure F.18.
3. Remove the input contactor cover plate using a phillips head screwdriver.

WARNING



Do not apply input power to the machine with the input contactor cover plate removed.

---

4. Blow out any dirt or dust in or around the contacts with a low pressure air stream.
5. Inspect the contacts for signs of excessive wear, pitting, or contacts fused (stuck) together.
   a. If any of these conditions are present, replace the input contactor assembly.
6. Replace the input contactor cover plate.

CONTACTOR REPLACEMENT PROCEDURE

1. Disconnect main input supply power to the machine.
2. Locate and get access to the input contactor (CR1) in the input box. See Figure F.18.
3. Disconnect the main input supply power leads L1, L2, and L3 to the input contactor.

   Remove the control transformer primary leads H1, H2 or H3 (dependent on input voltage) from the L1 and L3 terminals on the input side of the contactor.
4. Disconnect the output leads T1, T2, and T3 from the input contactor.
5. Identify and label the leads connected to the input contactor coil. See the Wiring Diagram.
6. Disconnect the leads from the input contactor coil (leads X1, #256 and #255A). See the Wiring Diagram.
7. Remove the three self-tapping mounting screws using a 5/16" socket wrench.
8. Remove the input contactor.
9. Insert the replacement input contactor and install it following the procedures in reverse order.

   NOTE: Be sure to reconnect all leads correctly.

SCR RECTIFIER BRIDGE REMOVAL AND REPLACEMENT PROCEDURE

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

The following procedure will aid the technician in removing the SCR/Rectifier Bridge for maintenance or replacement.

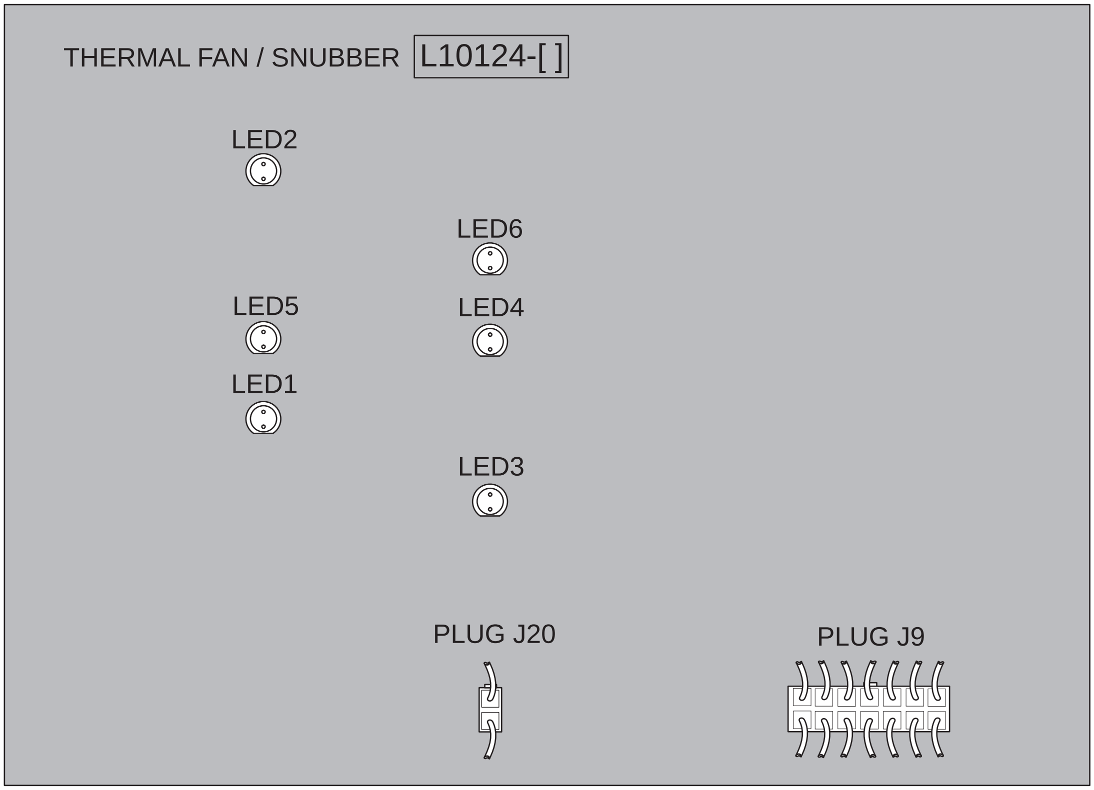
MATERIALS NEEDED

1/2” Socket wrench
3/8” Wrench
1/2” Wrench
9/16” Wrench

Return to Section TOC
Return to Master TOC

SCR RECTIFIER BRIDGE REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

FIGURE F.19 - THERMAL FAN/SNUBBER BOARD PLUG LOCATIONS



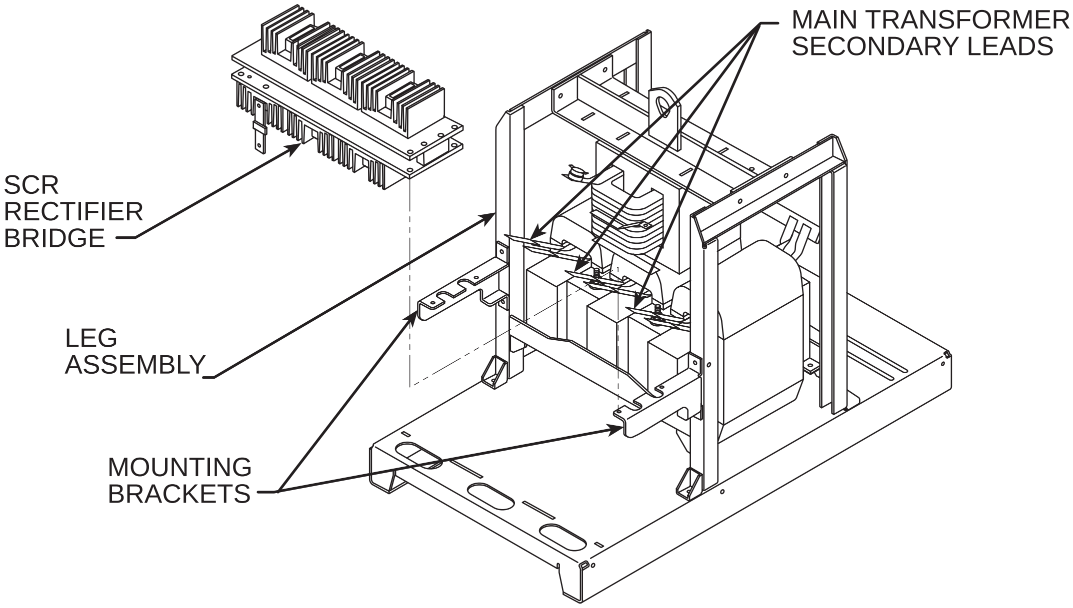
PROCEDURE

1. Remove the input power to the DC-655 machine.
2. Using the 3/8" wrench, remove the case top and sides.
3. Locate and remove plugs J9 and J20 from the Thermal Fan/Snubber Board. See Figure F.19.
4. Disconnect lead #222 from the negative high inductance output terminal. This lead runs from plug J9 to the negative high inductance output terminal. Cut any necessary cable ties. See the Wiring Diagram.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SCR RECTIFIER BRIDGE REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

FIGURE F.20 – SCR RECTIFIER BRIDGE ASSEMBLY DETAILS



5. Using the 1/2” socket wrench, remove the six transformer secondary leads from the heat sink assembly. The small “A” leads do not have to be removed. Note lead placement for reassembly. See the Wiring Diagram and Figure F.20.
6. With the 9/16” wrench, remove the shunt from the left side of the heat sink assembly.
7. With the 3/8” wrench, remove the four mounting bolts that hold the heat sink assembly to the horizontal mounting brackets. Be sure to remove the insulators and take note of placement for reassembly.
8. While supporting the heat sink assembly, remove the left side horizontal mounting bracket from the left side leg assembly. See Figure F.20.
9. Carefully slide the rectifier heat sink assembly from the machine. Clear all leads.

REASSEMBLY

1. Upon reassembly, apply a thin coating of Dow Corning 340 Heat Sink Compound to all bolted connections.
2. With the left side horizontal mounting bracket removed, slide the heat sink assembly into the machine.
3. Support the heat sink assembly and install the left side mounting bracket. Then mount the heat sink assembly to the bracket with four bolts. Note insulator placement.
4. Attach the shunt to the left side of the heat sink assembly.
5. Install the six transformer secondary leads to the heat sink assembly. See the Wiring Diagram.
6. Connect lead #222 to the high inductance output terminal.
7. Install plugs J9 and J20 onto the thermal fan/snubber board.
8. Replace any cable ties cut at disassembly.
9. Install the case top and sides.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER AND CHOKE REMOVAL AND REPLACEMENT PROCEDURE

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 216-383-2531 or 1-800-833-9353 (WELD).

DESCRIPTION

The following procedure will aid the technician in removing the main transformer and choke for maintenance or replacement.

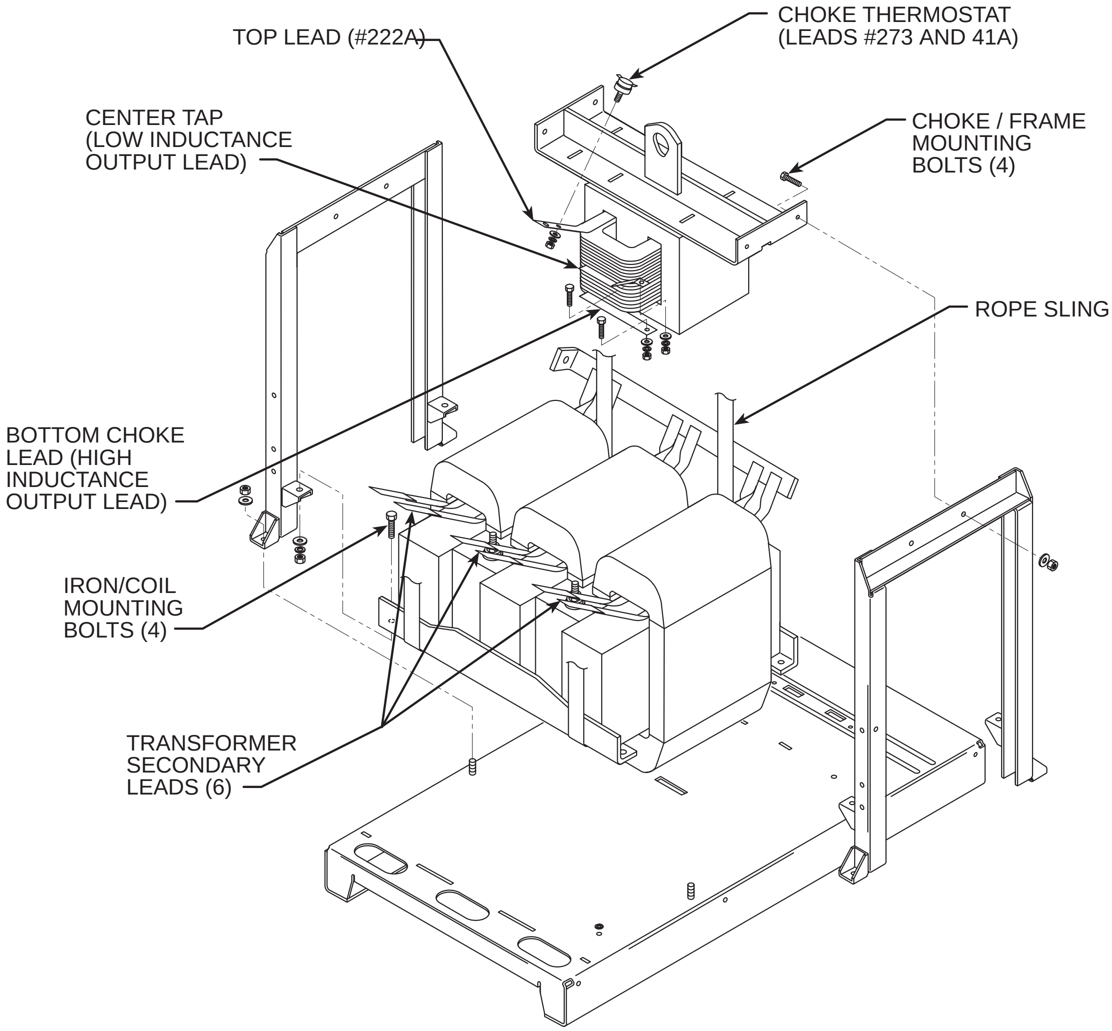
MATERIALS NEEDED

3/8” Wrench
7/16” Wrench
9/16” Wrench
Wire cutters
Soldering iron and solder
1/2” Socket wrench
9/16” Socket wrench

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER AND CHOKE REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

FIGURE F.21 – OUTPUT CHOKE/MAIN TRANSFORMER ASSEMBLY DETAILS



PROCEDURE

1. Remove the input power to the DC-655 machine.
2. Remove the case top and sides.

OUTPUT CHOKE REMOVAL

3. Label and remove leads #273 and 41A from the choke thermostat.
4. Using the 9/16” wrench, remove the flexible transformer secondary lead and the #222A lead from the top lead of the output choke. See Figure F.21.
5. Using the 9/16” wrench, remove the low inductance output lead from the center tap of the choke. See Figure F.21.
6. Using the 9/16” wrench, remove the high inductance output lead from the bottom choke lead. See Figure F.21.
7. Support the choke with a crane or hoist.
8. Using the 9/16” wrench, remove the four bolts, washers and nuts mounting the choke assembly to the transformer frame assembly.
9. Carefully lift the choke from the DC-655 machine.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

MAIN TRANSFORMER AND CHOKE REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

MAIN TRANSFORMER REMOVAL

10. With the 1/2" wrench, remove the six transformer secondary leads from the SCR heat sink assembly.
11. Remove the transformer primary leads from the reconnect panel. Label for reassembly.
12. Carefully label and unsolder the following leads from the transformer windings. Cut any necessary cable ties. See the Wiring Diagram.

❒ 335	❒ 203	❒ 31
❒ 336	❒ 204	❒ 32A
❒ 331	❒ 205	❒ 41
❒ 332	❒ 206	❒ 42A
❒ 333	❒ 207	❒ 41 thermostat
❒ 334	❒ 208	

13. Using a rope sling and hoist, support the iron/coil assembly. See ***Figure F.21.***
14. With the 9/16" wrench, remove the four bolts, washers and nuts holding the iron/coil assembly to the frame assembly.
15. Cut or remove any necessary cable ties.
16. Using the hoist, carefully remove the iron/coil assembly from the DC-655 machine. Clear all leads.

REASSEMBLY

1. Using the rope sling, carefully position the iron/coil assembly onto the DC-655. Mount it to the frame assembly with four bolts, washers and nuts.
2. Attach the transformer primary leads to the reconnect panel.
3. Attach the six transformer secondary leads to the SCR heat sink assembly.
4. Solder the following leads to the transformer windings.

❒ 335	❒ 203	❒ 31
❒ 336	❒ 204	❒ 32A
❒ 331	❒ 205	❒ 41
❒ 332	❒ 206	❒ 42A
❒ 333	❒ 207	❒ 41 thermostat
❒ 334	❒ 208	

5. Using a crane or hoist, carefully place the choke onto the main transformer.
6. Attach the high inductance output lead to the bottom choke lead.
7. Attach the low inductance output lead to the choke center tap.
8. Attach the #222A lead and flexible transformer secondary lead to the top choke lead.
9. Attach leads #273 and 41A to the choke thermostat.
10. Replace any cable ties cut at disassembly.
11. Install the case top and sides.

RETEST AFTER REPAIR

Should a machine under test be rejected for any reason requiring the removal of any mechanical part that could affect the machine's electrical characteristics, or if any electrical components are repaired or replaced, the machine must be retested.

INPUT IDLE AMPS AND WATTS

Input volts/Phase/Hertz	Maximum Idle Amps	Maximum Idle KW
208/3/60	11.0	1.0
230/3/60	10.0	1.0
380/3/60	6.0	1.0
416/3/60	5.5	1.0
460/3/60	5.0	1.0
550/3/60	4.2.	1.0
575/3/60	4.0	1.0
200/3/50	21.0	1.3
220/3/50	19.1	1.3
230/3/50	18.3	1.3
380/3/50	11.0	1.3
400/3/50	10.5	1.3
415/3/50	10.1	1.3
440/3/50	9.6	1.3
500/3/50	8.4	1.3
550/3/50	7.7	1.3

MAXIMUM OPEN CIRCUIT VOLTAGES

Mode	Input Hertz	Open Circuit Volts
CC Stick	60	66/70
CV MIG	60	44/47
Auxiliary Output (#31-#32)	60	122/128 VAC
Auxiliary Output (#41-#42)	60	44/48 VAC

MINIMUM ACCEPTABLE OUTPUT VOLTAGE - AT MAXIMUM OUTPUT SETTINGS

Mode	Control Settings	Load
CC Stick	Output Control at Maximum Arc Force Control at Minimum	815 Amps @ 44.0 Volts (Min)
CV MIG	Output Control at Maximum	815 Amps @ 44.0 Volts (Min)
Auxiliary Output (#31-#32)	N/A	5 Amps @ 120/126 VAC (Min)
Auxiliary Output (#41-#42)	N/A	5 Amps #41/45 VAC (Min)

SVM ERROR REPORTING FORM

We need to know if there are errors in our manuals. We also value any suggestions as to additional tests or procedures that would make this SVM a better tool for you.

If you discover new or different "Problems or Symptoms" that are not covered in the three column troubleshooting chart, please share this information with us. Please include the machine's code number and how the problem was resolved.

Thank You,
Technical Services Group
Lincoln Electric Co.
22801 ST. Clair Ave.
Cleveland, Ohio 44117-1199

FAX 216-481-2309

SVM Number ___________________________

Page Number if necessary__________________

Your Company__________________________

Your Name_____________________________

Please give detailed description below:

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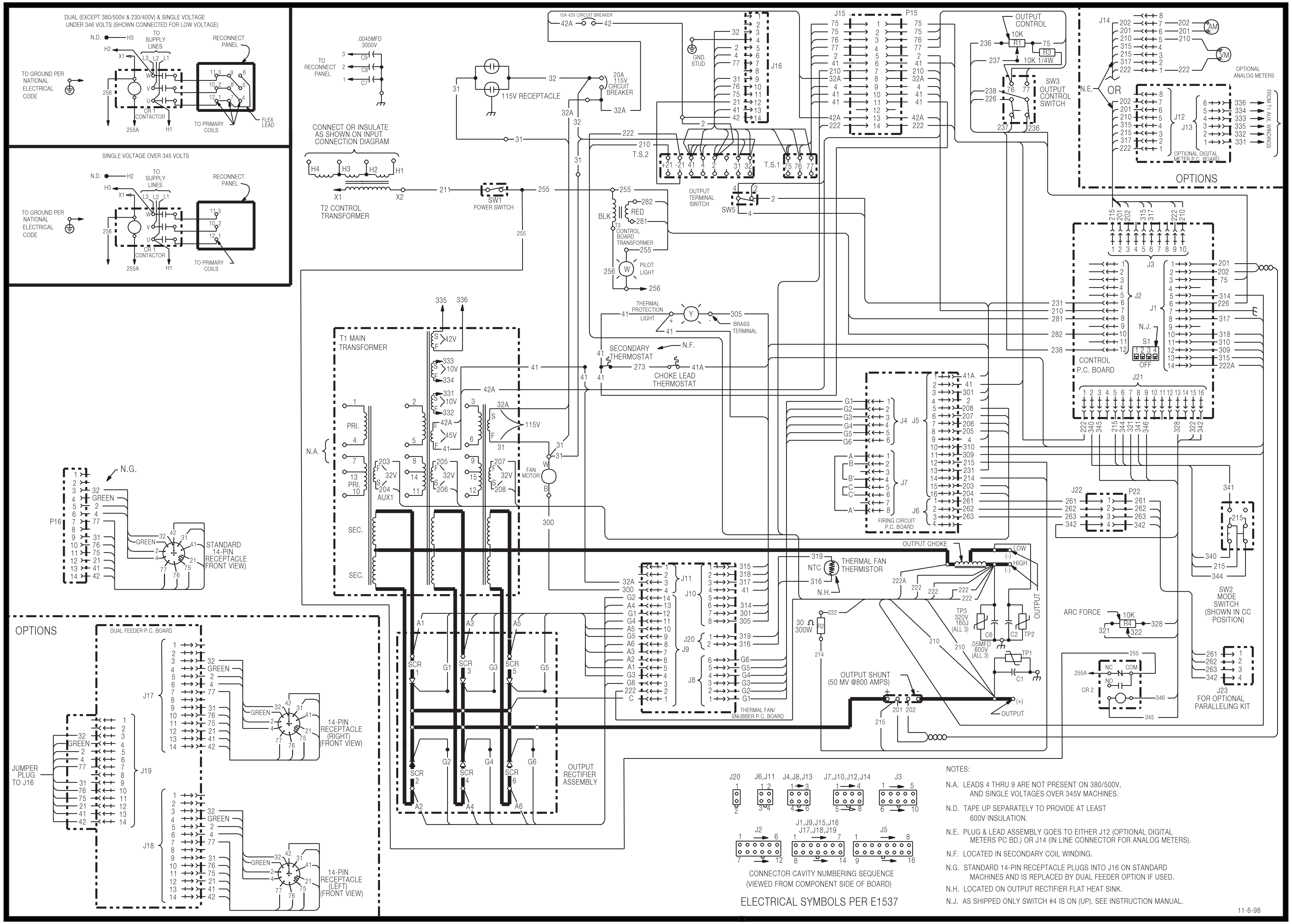
Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

TABLE OF CONTENTS
ELECTRICAL DIAGRAMS SECTION

LINCOLN ® ELECTRIC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Wiring Diagram (G3348-1)

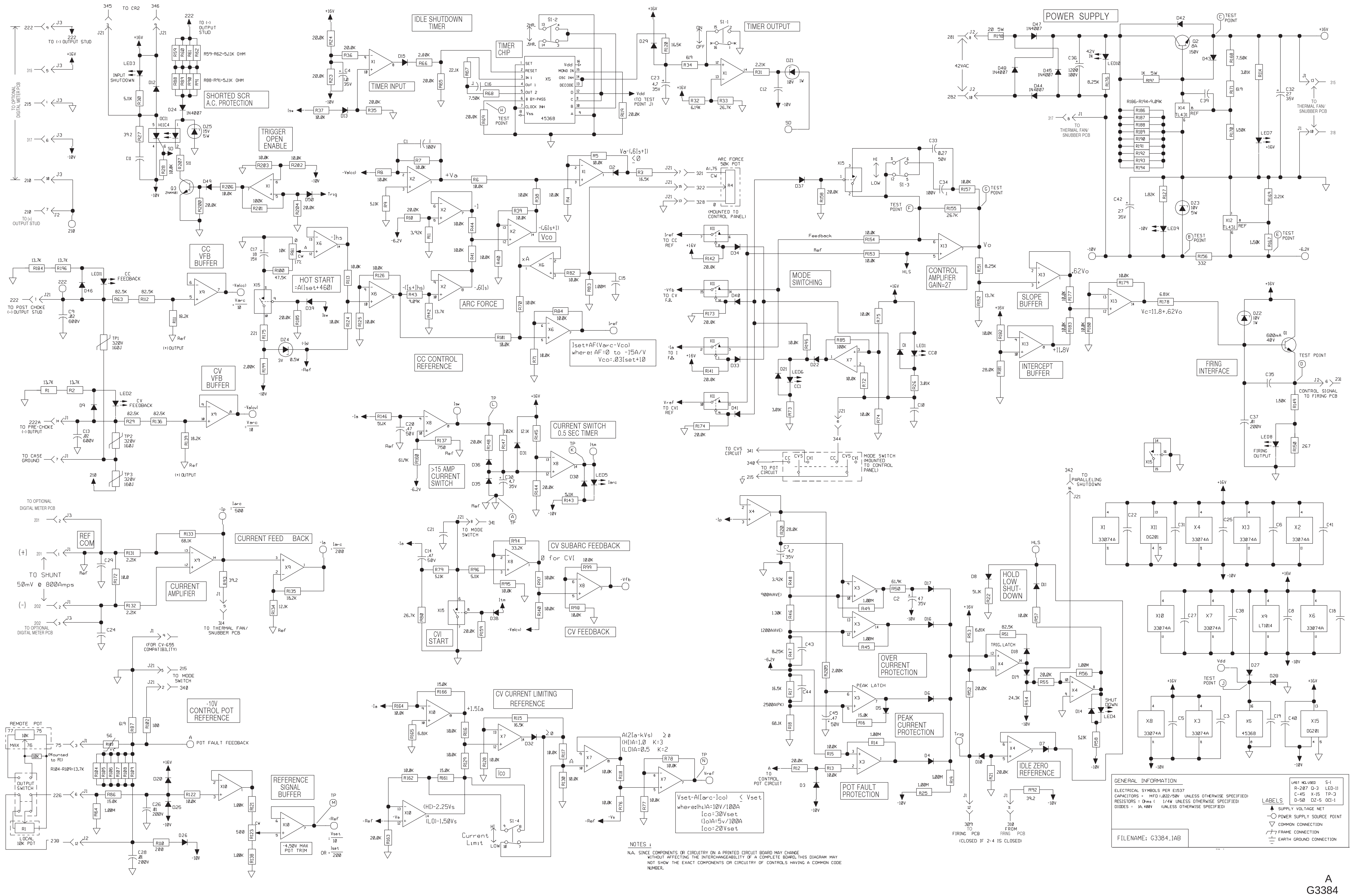


G3348-1
I-UF

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Control Board Schematic (G3384)

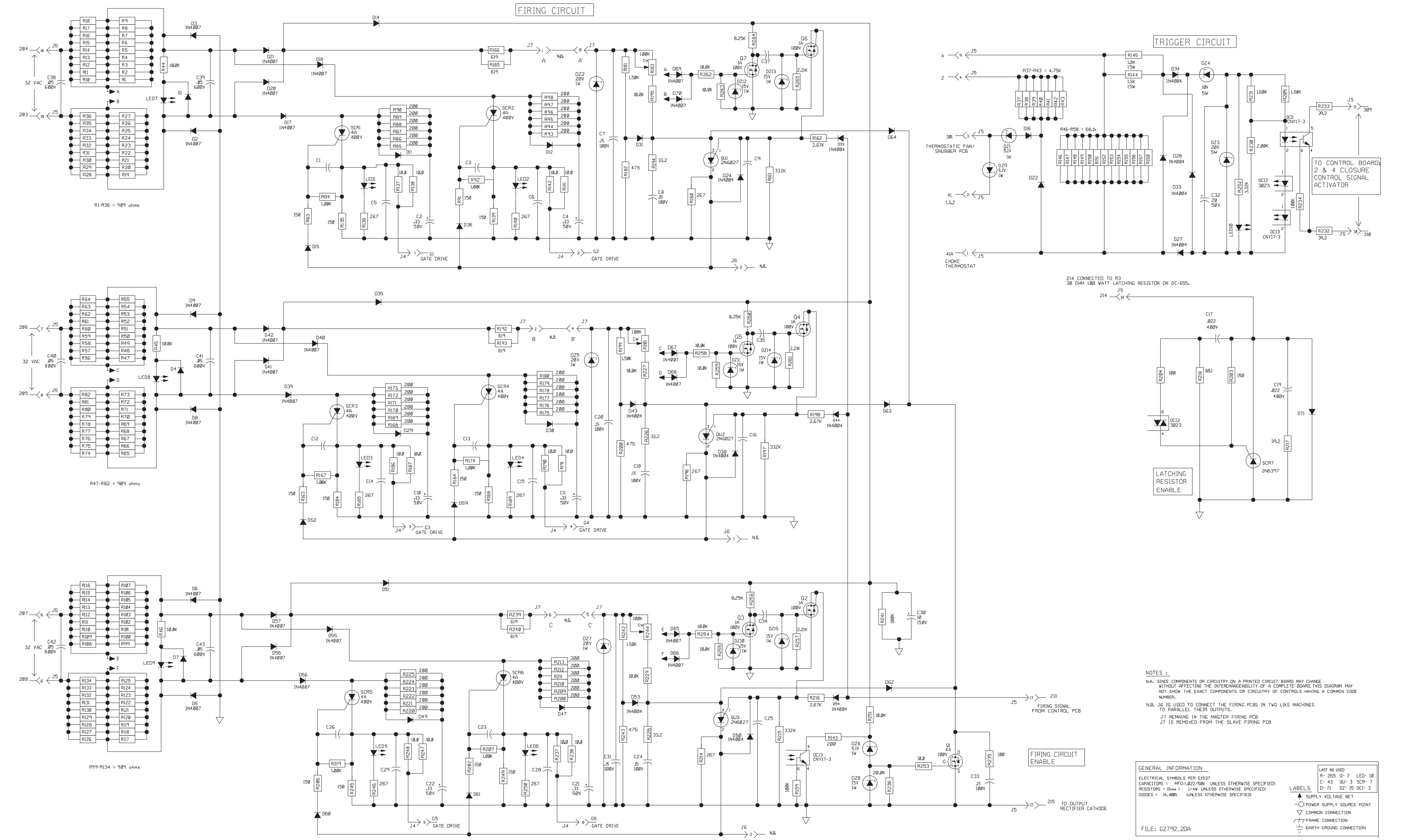


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G3384

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Firing Board Schematic (G2792)



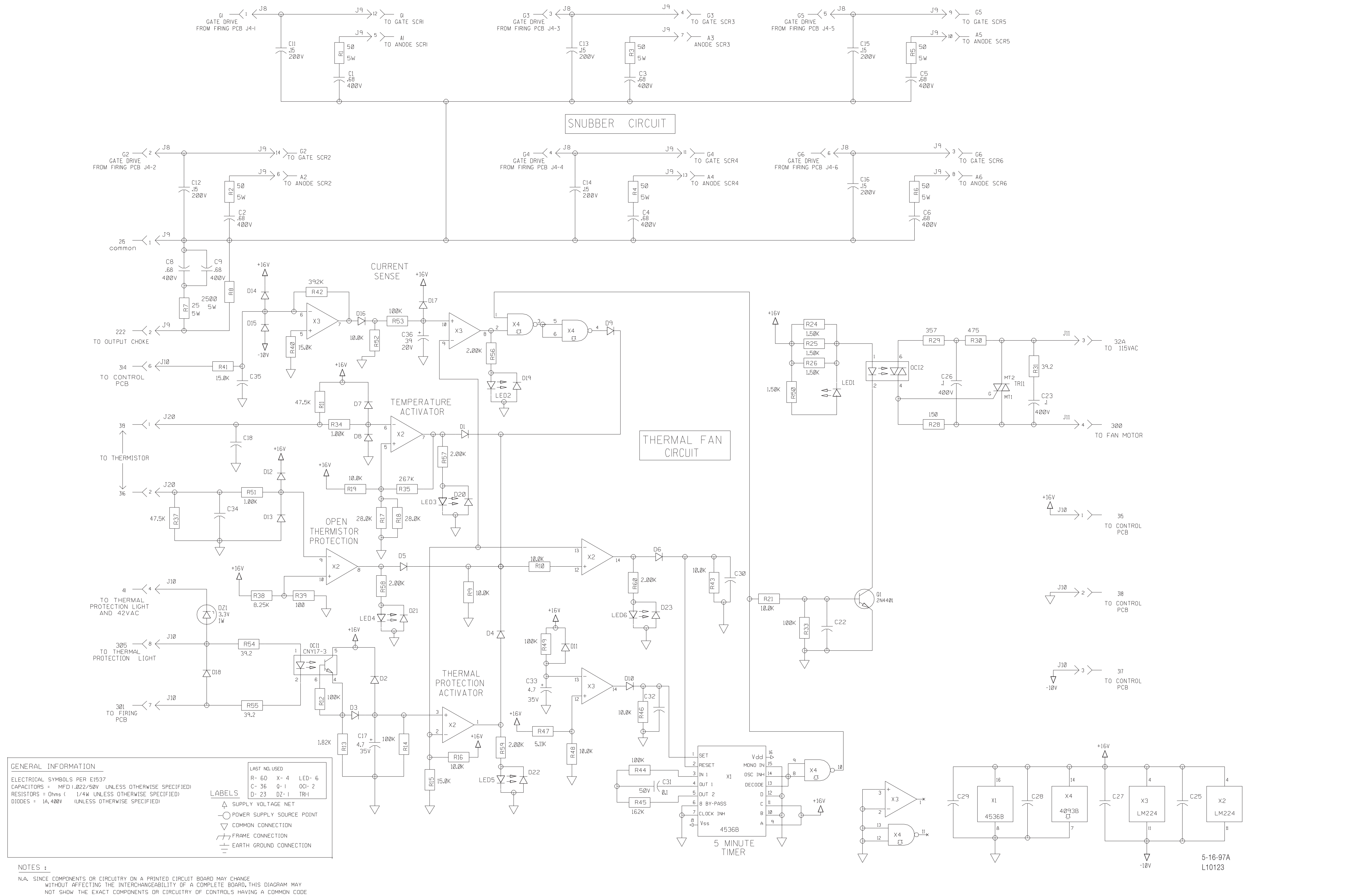
7-17-98A
G2792

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

G2792
7-17-98A

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Thermal Fan/Snubber Board Schematic (L10123)



NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

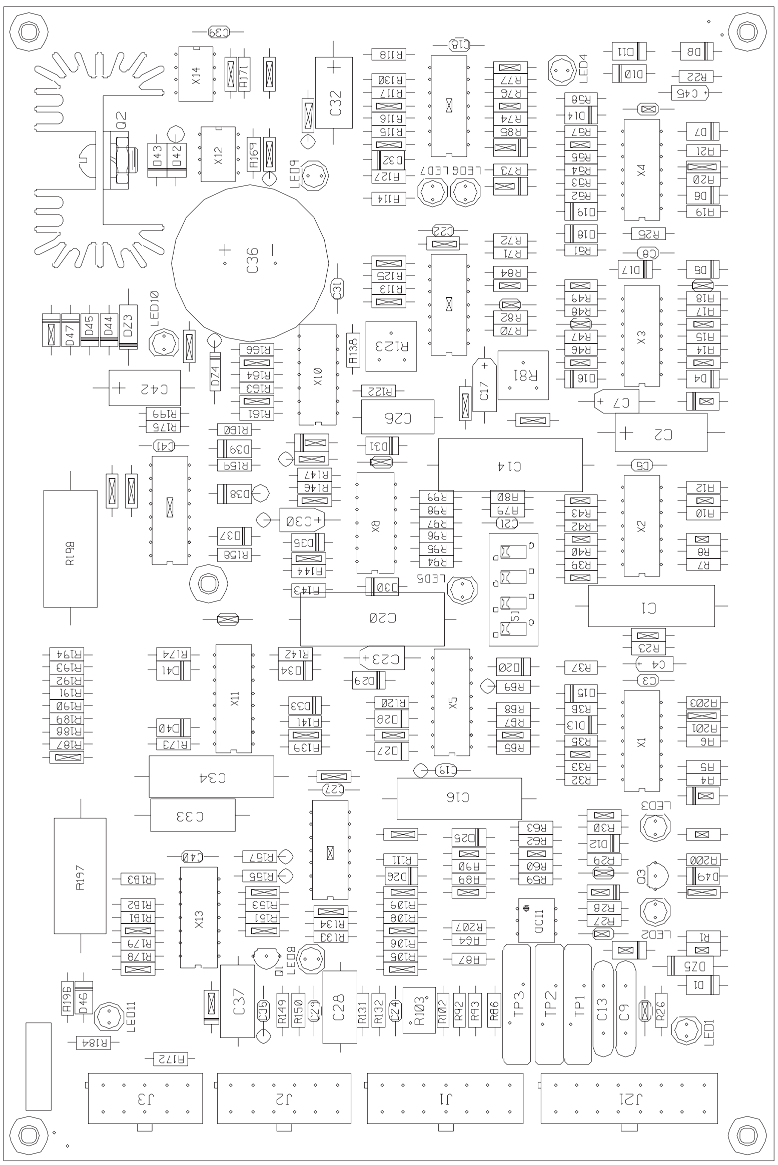
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5-16-97A

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
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Return to Master TOC

Control Board Layout (G3385-1)

ITEM	REQ'D	PART N°.	IDENTIFICATION
R155	1	S19400-2673	267K 1/4W
R156	1	S19400-3320	332 1/4W
R157	1	S19400-4321	4.32K 1/4W
R172	1	S19400-10R0	10 1/4W
R175	1	S19400-2210	221 1/4W
R197	1	T14648-19	1K 5W
R198	1	T14648-23	20 5W
R199, R203	2	S19400-2001	2.0K 1/4W
R204	1	S19400-4750	475 OHM 1/4W
R207	1	S19400-5110	511 1/4W
S1	1	S19869-24	SLIDE SWITCH, SPDT
TP1, TP2, TP3	3	T13640-18	160J
X1, X2, X3, X4, X6, X7, X8, X10, X13	9	S15128-18	IC, 33074A, OP-AMP, QUAD, HIGH-PERF
X5	1	S15018-13	16 PIN I.C. (SS)
X9	1	S15128-16	IC, LT1014, LINEAR INTEGRATED CIRCUIT
X11, X15	2	S15018-11	CMOS ANALOG SWITCH I.C. (SS)
X12, X14	2	S15128-10	IC, 431, VOLTAGE REF.

ITEM	REQ'D	PART N°.	IDENTIFICATION
C1, C16	2	T11577-26	.1/100
C2	1	S13490-66	47/35
C3, C5, C6, C8, C10, C11, C12 C15, C18, C19, C21, C22, C24 C25, C27, C29, C31, C35, C38 C39, C40, C41, C43, C44, C46, C47	26	S16668-5	.022/50
C4	1	S13490-42	1.0/35
C7, C23, C30	3	S13490-25	4.7/35
C9, C13	2	T11577-38	.02/600
C14, C20	2	S13490-49	.47/50
C17	1	S13490-39	18/15
C26, C28, C37	3	T11577-32	.01/200
C32, C42	2	S13490-93	27/35
C33	1	S13490-130	.27/50
C34	1	S13490-99	.027/200V
C36	1	S13490-138	1200/100
C45	1	S13490-63	.47/50
C48	1	S16668-9	150Pfd 100V
D1, D2, D3, D4, D5, D6, D7, D8, D9 D10, D11, D12, D13, D14, D15 D16, D17, D18, D19, D20, D21 D22, D25, D26, D27, D28, D29 D30, D31, D32, D33, D34, D35 D36, D37, D38, D39, D40, D41 D42, D43, D46, D49	43	T12199-1	1N4004
D44, D45, D47, D48	4	T12199-2	1N4007
DZ1, DZ2	2	T12702-27	1N4740
DZ3	1	T12702-33	1N5347B
DZ4	1	T12702-30	1N5225B
DZ5	1	T12702-23	1N5352B
J1	1	S18248-14	HEADER
J2	1	S18248-12	HEADER
J3	1	S18248-10	HEADER
J21	1	S18248-16	HEADER
LED1, LED2, LED3, LED4, LED5 LED6, LED7, LED8, LED9, LED10 LED11	11	T13657-2	RED LED
OCI 1	1	S15000-8	OPTO ISOLATOR
Q1, Q3	2	T12704-68	2N4401
Q2	1	S18105-4	HEAT SINK ASBLY
R1, R2, R42, R104, R105, R106 R107, R108, R109, R152, R184 R196	12	S19400-1372	13.7K 1/4W
R3, R134, R145	3	S19400-1212	12.1K 1/4W
R4, R5, R6, R7, R8, R13, R15, R28 R37, R38, R39, R40, R41, R44 R57, R70, R71, R72, R74, R75 R76, R77, R78, R82, R84, R95 R97, R98, R99, R101, R113, R116 R117, R118, R122, R124, R125 R126, R128, R129, R130, R140 R153, R154, R162, R164 R177, R179, R180, R182, R183 R195	52	S19400-1002	10K 1/4W
R9, R30, R58, R59, R60, R61, R62 R79, R88, R89, R90, R91, R96 R143	14	S19400-5111	5.11K 1/4W
R10, R12, R21, R23, R24, R35 R36, R52, R55, R65, R69, R119 R141, R142, R144, R148, R158 R159, R163, R173, R174, R185 R200	23	S19400-2002	20K 1/4W
R11, R48, R205	3	S19400-3921	3.92K 1/4W
R14, R19, R25, R45, R49, R56 R64, R83	8	S19400-1004	1M 1/4W
R16, R86, R161, R166	4	S19400-1502	15K 1/4W
R17, R115, R120	3	S19400-1652	16.5K 1/4W
R18, R133	2	S19400-6812	68.1K 1/4W
R20, R181, R202	3	S19400-2802	28.0K 1/4W
R22, R146	2	S19400-5112	51.1K 1/4W
R26, R73, R114	3	S19400-3011	3.01K 1/4W
R27, R92	2	S19400-39R2	39.2 1/4W
R29, R51, R63, R112, R136	5	S19400-8252	82.5K 1/4W
R31, R131, R132, R169	4	S19400-2211	2.21K 1/4W
R32	1	S19400-6191	6.19K 1/4W
R33, R80	2	S19400-2672	26.7K 1/4W
R34, R87, R171	3	S19400-6190	619 1/4W
R43, R186, R187, R188, R189 R190, R191, R192, R193, R194	10	S19400-9091	9.09K 1/4W
R46	1	S19400-1301	1.3K 1/4W
R47, R151, R176	3	S19400-8251	8.25K 1/4W
R50, R160	2	S19400-6192	61.9K
R53, R165, R178	3	S19400-6811	6.81K 1/4W
R54	1	S19400-2432	24.3K 1/4W
R66	1	S19400-2801	2.8K 1/4W
R67	1	S19400-2212	22.1K 1/4W
R68, R168	2	S19400-7501	7.5K 1/4W
R81	1	T10812-41	10K 1/2W TRIMMER
R85, R201	2	S19400-1003	100K 1/4W
R93, R121, R138	3	S19400-1001	1K 1/4W
R94	1	S19400-3322	33.2K 1/4W
R100	1	S19400-4752	47.5K 1/4W
R102	1	S19400-1000	100 1/4W
R103	1	S18380-1	PTC THERMISTOR
R110	1	S19400-2000	200 1/4W
R111, R135, R139	3	S19400-1822	18.2K 1/4W
R123	1	T10812-62	500 1/2W TRIMMER
R127	1	S19400-1821	1.82K 1/4W
R137	1	S19400-7500	750 1/4W
R147	1	S19400-1023	102K 1/4W
R149, R167, R170	3	S19400-1501	1.5K 1/4W
R150	1	S19400-2670	267 1/4W



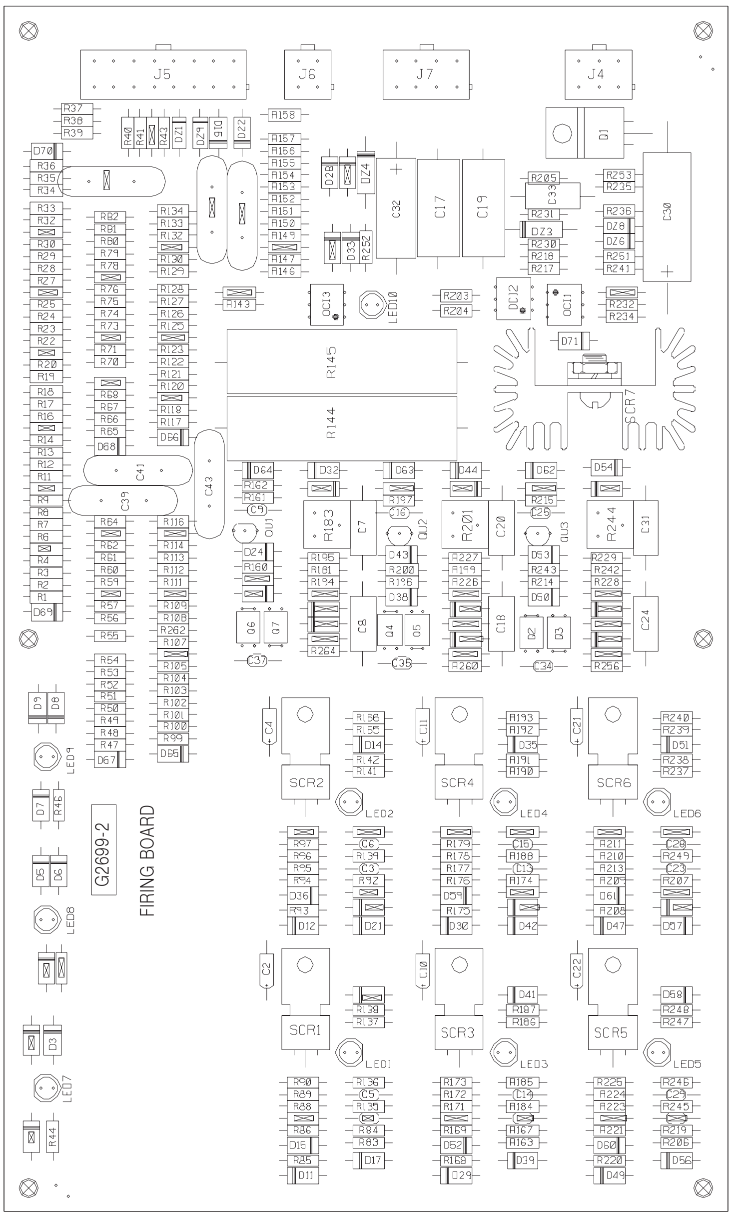
CAPACITORS = MFD/VOLTS
RESISTORS = OHMS/1/4 WATT UNLESS OTHERWISE SPECIFIED

C-RW
G3385-1

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Return to Section TOC
Return to Master TOC

Firing Board Layout (G2699-2)



ITEM	REQ'D	PART NO.	DESCRIPTION
C1, C3, C5, C6, C9, C12, C13, C14 C15, C16, C23, C25, C26, C28 C29, C34, C35, C37	18	S16668-5	.022/50
C2, C4, C10, C11, C21, C22	6	S13490-95	.33/50
C7, C8, C18, C20, C24, C31, C33	7	S13490-108	.15/100
C17, C19	2	T11577-41	.022/400
C30	1	S13490-74	10/150
C32	1	S13490-73	20/50
C38, C39, C40, C41, C42, C43	6	T11577-46	.05/600V
D1, D4, D7, D11, D12, D14, D15 D16, D22, D24, D27, D28, D29 D30, D31, D32, D33, D34, D35 D36, D38, D43, D44, D47, D49 D50, D51, D52, D53, D54, D59 D60, D61, D62, D63, D64	36	T12199-1	1N4004
D2, D3, D5, D6, D8, D9, D17, D18 D20, D21, D39, D40, D41, D42 D55, D56, D57, D58, D65, D66 D67, D68, D69, D70, D71	25	T12199-2	1N4007
DZ1, DZ6, DZ9	3	T12702-52	1N4733A
DZ2, DZ5, DZ7	3	T12702-4	1N4747
DZ3	1	T12702-25	1N5357B
DZ4	1	T12702-33	1N5347B
DZ8, DZ10, DZ11, DZ12, DZ13 DZ14, DZ15	7	T12702-29	1N4744A
J4	1	S18248-6	HEADER
J5	1	S18248-16	HEADER
J6	1	S18248-4	HEADER
J7	1	S18248-8	HEADER
LED1, LED2, LED3, LED4, LED5 LED6, LED7, LED8, LED9, LED10	10	T13657-2	RED LED
OCI1, OCI3	2	S15000-10	OPTO ISOLATOR
OCI2	1	S15000-12	OPTOCOUPLER TRIAC DRIVER
Q1	1	T12704-80	HEXFET TRANS. (SS)
Q2, Q3, Q4, Q5, Q6, Q7	6	T12704-73	IC PKG MOSFET (SS)
QU1, QU2, QU3	3	T12707-4	2N6027
R1, R2, R3, R4, R5, R6, R7, R8, R9 R10, R11, R12, R13, R14, R15 R16, R17, R18, R19, R20, R21 R22, R23, R24, R25, R26, R27 R28, R29, R30, R31, R32, R33 R34, R35, R36, R47, R48, R49 R50, R51, R52, R53, R54, R55 R56, R57, R58, R59, R60, R61 R62, R63, R64, R65, R66, R67 R68, R69, R70, R71, R72, R73 R74, R75, R76, R77, R78, R79 R80, R81, R82, R99, R100, R101 R102, R103, R104, R105, R106 R107, R108, R109, R110, R111 R112, R113, R114, R115, R116 R117, R118, R119, R120, R121 R122, R123, R124, R125, R126 R127, R128, R129, R130, R131 R132, R133, R134	108	S19400-9090	909 1/4W
R37, R38, R39, R40, R41, R42 R43	7	S19400-4751	4.75K
R44, R45, R46, R195, R227, R229 R251, R254, R255, R258, R259 R262, R263	13	S19400-1002	10K 1/4W
R83, R91, R135, R139, R163 R164, R184, R188, R202, R203 R206, R245, R249	13	S19400-1500	150 1/4W
R84, R92, R167, R174, R207 R219	6	S19400-1001	1K 1/4W
R85, R86, R87, R88, R89, R90 R93, R94, R95, R96, R97, R98 R143, R168, R169, R170, R171 R172, R173, R175, R176, R177 R178, R179, R180, R208, R209 R210, R211, R212, R213, R220 R221, R222, R223, R224, R225	37	S19400-2000	200 1/4W
R136, R140, R160, R185, R189 R196, R214, R246, R250	9	S19400-2670	267 1/4W
R137, R138, R141, R142, R186 R187, R190, R191, R237, R238 R247, R248, R253	13	S19400-10R0	10 1/4W
R144, R145	2	T14650-1	1500 OHMS, 15 W. RESISTOR
R146, R147, R148, R149, R150 R151, R152, R153, R154, R155 R156, R157, R158	13	S19400-6812	68.1K 1/4W
R159, R234, R241	3	S19400-1003	100K 1/4W
R161, R197, R215	3	S19400-3323	332K 1/4W
R162, R198, R216	3	S19400-2671	2.67K 1/4W
R165, R166, R192, R193, R239 R240	6	S19400-6190	619 1/4W
R181, R199, R205, R231, R242	5	S19400-1501	1.5K 1/4W
R182, R200, R243	3	S19400-4750	475 1/4W
R183, R201, R244	3	T10812-67	100K 1/2W TRIMMER
R194, R226, R228	3	S19400-33R2	33.2 1/4W
R204, R235	2	S19400-1000	100 1/4W
R217, R232, R233	3	S19400-39R2	39.2 1/4W
R218	1	S19400-68R1	68.1 1/4W
R230	1	S19400-2001	2.0K 1/4W
R236	1	S19400-2002	20K 1/4W
R252	1	S19400-3321	3.32K 1/4W
R256, R260, R264	3	S19400-8251	8.25K 1/4W
R257, R261, R265	3	S19400-2211	2.21K 1/4W
SCR1, SCR2, SCR3, SCR4, SCR5 SCR6	6	S15161-19	4A., 400V. SCR
SCR7	1	S18395-21	SCR HS ASBLY

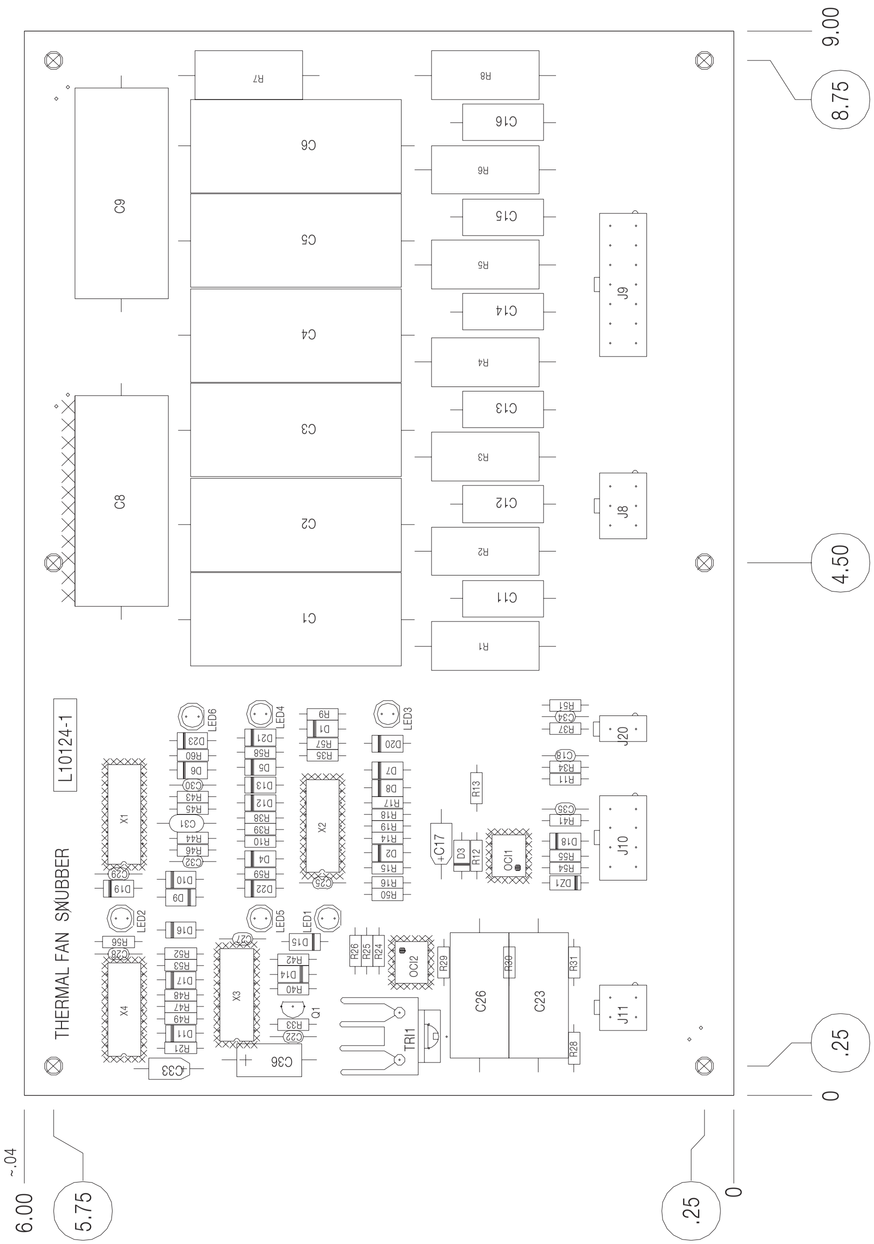
CAPACITORS = MFD/VOLTS
RESISTORS = OHMS

7-17-98A
G2699-2

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Return to Section TOC
Return to Master TOC

Thermal Fan/Snubber Board Layout (L10124-1)



ITEM	REQ'D	PART NO.	IDENTIFICATION
C1,C2,C3,C4,C5,C6,C8,C9	8	T11577-68	0.68 MFD /400 WVDC CAPACITOR
C11,C12,C13,C14,C15,C16	6	S13490-96	.15/200
C17,C33	2	S13490-25	4.7/35
C18,C22,C25,C27,C28,C29 C30,C32,C34,C35	10	S16668-5	.022/50
C23,C26	2	T11577-57	0.1/400
C31	1	S16668-11	.1/50
C36	1	S13490-104	39uF/20V
D1,D2,D3,D4,D5,D6,D7,D8,D9 D10,D11,D12,D13,D14,D15 D16,D17,D18,D19,D20,D21 D22,D23	23	T12199-1	1N4004
DZ1	1	T12702-53	1N4728A
J8	1	S18248-6	HEADER
J9	1	S18248-14	HEADER
J10	1	S18248-8	CONNECTOR
J11	1	S18248-4	HEADER
J20	1	S18248-2	HEADER
LED1,LED2,LED3,LED4,LED5 LED6	6	T13657-2	RED LED
OCI1	1	S15000-10	OPTO ISOLATOR
OCI2	1	S15000-12	OPTOCOUPLER TRIAC DRIVER
Q1	1	T12704-68	2N4401
R1,R2,R3,R4,R5,R6	6	T14648-22	50 5W
R7	1	T14648-2	25 5W
R8	1	T14648-9	5W / 2500 OHM RESISTOR
R9,R10,R16,R19,R21,R43,R46 R48,R52	9	S19400-1002	10K 1/4W
R11,R37	2	S19400-4752	47.5K 1/4W
R12,R14,R33,R44,R49,R53	6	S19400-1003	100K 1/4W
R13	1	S19400-1821	1.82K 1/4W
R15,R40,R41	3	S19400-1502	15K 1/4W
R17,R18	2	S19400-2802	28.0K 1/4W
R24,R25,R26,R50	4	S19400-1501	1.5K 1/4W
R28	1	S19400-1500	150 1/4W
R29	1	S19400-3570	357 1/4W
R30	1	S19400-4750	475 1/4W
R31,R54,R55	3	S19400-39R2	39.2 1/4W
R34,R51	2	S19400-1001	1K 1/4W
R35	1	S19400-2673	267K 1/4W
R38	1	S19400-8251	8.25K 1/4W
R39	1	S19400-1000	100 1/4W
R42	1	S19400-3923	392K 1/4W
R45	1	S19400-1623	162K/.25W
R47	1	S19400-5111	5.11K 1/4W
R56,R57,R58,R59,R60	5	S19400-2001	2.0K 1/4W
TRI1	1	S18395-27	TRIAC/HEAT SINK ASSEMBLY
X1	1	S15018-13	16 PIN I.C. (SS)
X2,X3	2	S15128-4	LM224 OP-AMP
X4	1	S15018-15	14 PIN I.C. (SS)

CAPACITORS = MFD/VOLTS
RESISTORS = OHMS

5-16-97A
L10124-1

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NOTES